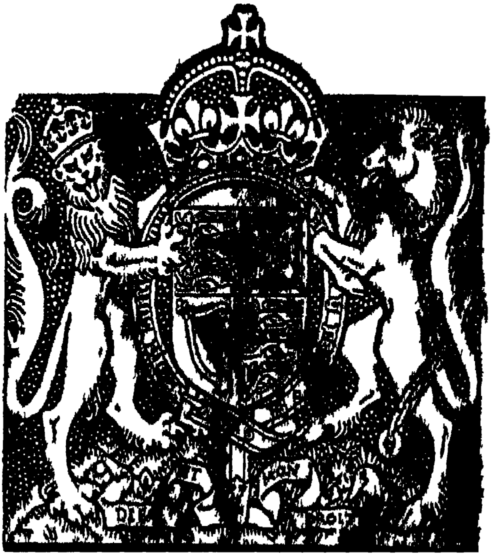

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EXPERIMENT STATION RECORD

VOL. 70 JANUARY, 1934 No. 1

EDITORIAL

THE FORTY-SEVENTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The forty-seventh convention of the Association of Land-Grant Colleges and Universities, held in Chicago from November 13 to 15, 1933, will probably take high rank among the many significant and important gatherings of that body. Seldom has the desirability of assembling for enlightenment and counsel been more apparent or the results more stimulating and encouraging.

Readjustment to the prevailing economic conditions was the dominant theme of the meeting, or, as stated by chairman R. A. Pearson of the executive committee, "What can the land-grant institutions best do to serve the Nation at this time?" To the demands of this readjustment the convention revealed itself anew as responsive, alert, and constructive.

To an unusual degree the convention was representative. The registration of the association totaled nearly 300, and many others attended sessions during the week of the American Society of Agronomy, the American Soil Survey Association, and the National Association of State Universities. Every State was included except New Mexico, and 36 States and Alaska were represented by the presidents or comparable executives. In many cases the delegations were larger than for several years. The experiment station directors recorded numbered 44, the extension directors 40, and the deans of colleges of agriculture 33, of home economics 22, and of engineering 21.

The United States Department of Agriculture was represented by the Secretary, the Directors of Scientific Work and Extension Work, several bureau chiefs, and others; the Department of the Interior by the Commissioner of Education; the newer governmental agencies by prominent members of the Agricultural Adjustment Administration, the Farm Credit Administration, and the Tennessee Valley Authority; and the American Farm Bureau Federation by its president. The meetings thus brought together a very considerable proportion of the agricultural leadership of the Nation.

Advantage was taken of the opportunity presented for a consideration of the problems of readjustment from various viewpoints. That of the association itself was appropriately set forth in the presidential address of President J. C. Futrall of the University of Arkansas. President Futrall interpreted the main objective originally contemplated as that of extending on a democratic basis the privileges of higher education to individuals not reached by existing institutions, and pointed out that not only the good of the individual has thereby been achieved but society as a whole has been vastly benefited. So tangible have been the accomplishments achieved in education and research under the system developed that he maintained that not even the pressure for economy and retrenchment would justify the closing of the door of opportunity which the land-grant institutions have opened to the masses in these fields.

Noteworthy among the addresses advocating specific readjustments was that of Secretary of Agriculture Henry A. Wallace. The land-grant institutions, in his opinion, must now broaden their vision beyond technical problems of agriculture and engineering by assistance in such new undertakings as the regulation of production and planned land utilization. He therefore suggested the advisability of a reexamination of work under way with a view to the concentration of effort and resources upon projects of immediate significance and applicability to present conditions.

A paper by President William E. Wickenden of the Case School of Applied Science on the social orientation of engineering education likewise maintained that this is the time for scientific men to "stop, look, and listen." Whereas the early engineer was largely individualistic in work and outlook and had little appreciation of consumer viewpoints, the present need is for a recognition of responsibility in such social problems as technological unemployment, public works policies, and the provision of a more healthful and comfortable environment. A more humane understanding of the results of engineering achievements was seen as the outstanding need of the day.

Somewhat closely related to this view was that advanced by Dr. Arthur E. Morgan, chairman of the Tennessee Valley Authority, who discussed this undertaking as an experimental project in sociological and economic planning in a limited area. Among other aspects of the work, he found great educational possibilities in the study in this area of such phases as land utilization, control of soil erosion, development of irrigation under southeastern conditions, and group cooperation and recreation.

The relations of educational institutions to the readjustment agencies were discussed by the new Federal Commissioner of Education, Dr. George F. Zook. Substantial and increasing assistance was reported from the Public Works Administration in financing college and school construction programs, coupled with virtually complete exemption from the labor and other requirements of the National Recovery Administration. He reported that a program of education in the Civilian Conservation Camps is being developed, and that while expenditures under the Emergency Relief Administration for instruction in rural schools and elsewhere have been directed primarily from the standpoint of work relief, much is being learned as to the needs and possibilities of adult education and in other ways. Federal aid in education, he reported, is being sought to an unprecedented extent, and he expressed himself as convinced of the needs and possibilities of reorganization in education—higher, secondary, and elementary—to render it both more economical and more effective.

The work and problems of the Farm Credit Administration were explained by Dr. W. I. Myers, at the time Deputy Governor and subsequently appointed Governor of that organization, and the purposes of the Agricultural Adjustment Administration were set forth by Prof. M. L. Wilson, Director of the Subsistence Homestead Division, and Mr. Chester C. Davis, then Chief of the Production Division. Both representatives of the Agricultural Adjustment Administration discussed its emergency aspects, and Prof. Wilson also considered the long-time situation in some detail. He pointed out that the withdrawal from cultivation of millions of acres would raise many questions of land utilization, and that coordinated research, preferably by the experiment stations and the Federal Department of Agriculture, would be required for their solution. Study of the possibilities of "part-time" farming by the stations was also suggested as of great advantage in the development of "rural-urban" subsistence farms.

In a message from organized agriculture, President Edward A. O'Neal of the American Farm Bureau Federation spoke briefly of the land-grant colleges and their new opportunity. He pointed out that these institutions were going concerns when the necessity arose for the Agricultural Adjustment Administration and other programs, and consequently that they were readily mobilizable for immediate assistance. Adequately maintained, he declared that they should be of great future service in the planned agriculture which he foresaw as an impending development, and he visioned them as especially necessary in a sound land utilization program in both its material aspects and that of human relationships.

The stirring and stimulating address of President Glenn Frank of the University of Wisconsin, entitled "The Dynamics of Recovery", found in the recovery program a challenge to more than conventional farm leadership, since the problem is "to readjust an old order to a new world." He pointed out the interdependency of agriculture with other phases of national activity, and proposed acceleration of consumption as the most promising permanent remedy if retrogression to the deprivations of pioneer days is to be avoided. From this point of view he maintained that a curtailment of agricultural research because of its alleged intensification of production would be a national tragedy, leaving farmers a prey at once to nature's hazards and the avarice of other classes of society. He therefore argued for a strengthening of research agencies but with some redirection of objectives. He also drew attention to what he deemed an overproduction by the colleges of prospective agricultural teachers, extension workers, and specialists, the demand for which is now largely on a replacement basis, and advocated greater attention to the training of farmers.

The question of educational objectives received further attention in the various section meetings. The joint sessions of the section on agriculture were devoted almost entirely to the problem of the training of farmers and homemakers. President R. S. Shaw, of Michigan, discussed such methods as the farmers' institutes of early days, the Smith-Hughes schools, the 4-H clubs, the use of radio and special publications, farmers' weeks at the colleges, and especially the provision of short courses, which he deemed very useful at the present time. Dean R. L. Watts of Pennsylvania reported the results of a questionnaire which he had circulated as to the prevailing practice in training for farm life. Dean J. F. Cunningham of Ohio discussed agricultural college publications for farmers, Dean C. P. Blackwell of Oklahoma the function of research in training farmers, and Prof. J. B. Davidson of Iowa some trends in the extension service, while a paper by Mrs. Jane S. McKimmon of North Carolina considered the development of leadership among farm women by systematic training.

Dean Watts' questionnaire revealed some differences of opinion as to major college objectives, but noted that of the 48 colleges responding, only 8 made no claim as to training farmers, while 19 reported 2-year courses. His studies indicated that while the primary duty of the colleges is to train for citizenship there should be no evasion of vocational objectives, although some confusion still exists as to the proper balance between these functions. In any case, however, he maintained that the instruction should be of college grade, that it should lead students to think for themselves, and that high quality of instruction was more important than subject matter.

The subsection of extension work considered in more detail the problems presented by the agricultural adjustment program, the farm credit situation, and the possibilities of workmen's garden homesteads, closing with a paper by Dr. O. E. Baker of the U.S.D.A. Bureau of Agricultural Economics on future land requirements necessary to supply domestic needs of agricultural commodities. Similarly, a paper before the general session by Director Flora Rose of the New York State College of Home Economics dealt with the place of home economics in a changing society, showing that many new values profoundly affect the home and need interpretation by home economics workers. The home economics section devoted a session to programs for cooperation in State relief work and another to proposed changes in food control and the provision of consumers' standards specifications.

Research programs came in for a similar scrutiny throughout the convention. Following the custom of recent years, however, discussion of these phases is reserved for the February issue of the *Record.*

The sessions of the executive body were as usual held behind closed doors, and information as to action taken on most matters of business is therefore not available for presentation at this time. The next president was again selected from the South, President T. O. Walton of Texas being advanced from the vice presidency. President W. E. Clark of Nevada was elected vice president, and Dean T. P. Cooper of Kentucky was reelected secretary-treasurer. Dean O. M. Leland of Minnesota succeeded Dean F. E. Turneaure of Wisconsin on the executive committee for a 5-year term. The various section officers and changes in committees are noted on page 144.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A new characterization of the gluten proteins, R. M. Sandstedt and M. J. Blish (*Cereal Chem., 10 (1933), No. 4, pp. 359–366*).—The authors of this contribution from the Nebraska Experiment Station "would present a picture of three main dissociable component systems, each system in turn consisting of a group of lesser dissociable components or complexes. Any so-called 'purified protein preparations' from wheat flour or gluten probably consists of a group of these dissociable complexes having somewhat similar properties, and preparations having constant properties are obtained only so long as the same method of preparation is adhered to in all details. Variations in methods of preparation cause variations as to the components or 'complexes' involved, and variations can be shown by measurable differences, both in chemical composition (products of hydrolysis) and in properties such as solubility, coherence, elasticity, viscosity, and susceptibility to denaturation. These differences and variations are systematic and progressive as one goes from the glutenin through the mesonin and gliadin groups in the order mentioned."

The authors find it very probable that irreversibility in the glutenin system is due to the comparatively ready denaturation of the gel form of this system by contact with the reagents from which it has been precipitated. Neutral reaction is found to favor this denaturation, methyl alcohol having a much greater denaturing effect than ethyl alcohol, while potassium sulfate denatures the system more readily than do many other salts.

The hydration capacity of starch, R. A. Gortner (*Cereal Chem., 10 (1933), No. 4, pp. 298–312, figs. 6*).—Applying the Kunitz formula [1]

$$\frac{\eta}{\eta_0}=\frac{1+0.5\phi}{(1-\phi)^4},$$

in which ϕ=the ratio of space occupied by the disperse phase (solvated micelles) to the total volume of the system to convert the relative viscosity of the lyophilic sols to an expression of the volume occupied by the dispersed phase of starch sol viscosity data, the author of this contribution from the Minnesota Experiment Station shows that starches derived from various botanical sources differ widely in hydration capacity. Wheat starches from different wheat sorts differ somewhat is hydration capacity, but not nearly so much as the values for the relative viscosity of the respective sols would indicate. The hydration capacity of wheat starch (volume occupied by 1 g of the heat-gelatinized starch) is apparently the same at 90° as at 25° C. The continued heating of gelatinized starch pastes produces a rapid decrease in the hydration capacity. This change is much more rapid for potato starch sols than for wheat starch sols. Cold gelatinization of starch with chemicals is not the same phenomenon as heat gelatinization. Cold gelatinized wheat starch occupies a volume of 28–35 cc per gram, whereas heat-gelatinized wheat starch occupies only approximately one half this volume. The cold gelatinization of starch by chemical action appears to involve identical reactions irrespective of the chemical which is employed, e.g., NaOH, NaCNS, KCNS, sodium salicylate, or urea, although the maximum hydration of the starch occurs at widely different concentrations of the chemical. Cold gelatinization of starch involves at least three different reactions: (1) At low chemical concentration no hydration takes place; (2) as the concentration is increased a rapid swelling of the intact granules occurs, resulting eventually in a rupture of the granules; and (3) the individual micelles released from the starch granules continue to increase in volume (peptization) through an increasing concentration of the gelatinizing chemical. Finally, as more of the chemical is added, the concentration of the chemical in the dispersion medium becomes so great that a slow osmotic dehydration of the hydrated micelles takes place.

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[1] Jour. Gen. Physiol., 9 (1926), pp. 715–725.

Studies of grape pectin [trans. title], G. Barbera (*Ann. Tec. Agr., 6 (1933), No. 3, I, pp. 229–245, 350; Latin abs., p. 350*).—Pectin extracted by boiling water from the skin and flesh of grapes was found to contain a greater quantity of ash and a smaller percentage of methoxyl than did that obtained from oranges, strawberries, raspberries, etc. The high percentage of insoluble pectin from grape skin and, as proved by experiments here carried out, the ease with which it loses the methyl alcohol under the action of the pectase explain the high percentage of the alcohol in the grape. The extracted pectin was found to yield arabinose, xylose, methyl alcohol, galacturonic acid, and galactose. The action of powdered pectase on the pectin of the grape liberated considerable quantities of methyl alcohol.

A simple method of preparing cellulose (hydrate) for cellulose agar, R. S. Sarkaria and Fazal-ud-Din (*Indian Jour. Agr. Sci., 3 (1933), No. 2, pp. 365–368*).—Cellulose hydrate was found to be precipitated only partially from cellulose solutions in concentrated sulfuric acid when these solutions were diluted at a temperature of from 60° to 65° C. in the proportion 20 parts of the acid + 12 parts of water. A very satisfactory product could be had by precipitating in the same dilution of the acid but at a temperature of from 35° to 40°, or by diluting in the proportion 20:14 at a temperature of from 40° to 45°. A method requiring much more time but considered to yield a distinctly superior product is thus described:

"Filter papers were placed side by side in 50 cc of 10 percent sulfuric acid solution in a porcelain dish in such a manner that the lower portions of each were dipped in the acid solution and the upper portions left exposed to the air. The dish with its contents was then placed at 37° in the incubator. After 24 hours the position of the filter papers was gently reversed, and the acid solution was drained off at the end of another interval of 24 hours. The filter papers were again incubated for a period of 48 to 72 hours when they had lost strength, breaking down even at a gentle touch. These were then carefully transferred over to the filtering apparatus and washed acid free. When free from acid, the material was thoroughly shaken with distilled water in a stoppered cylinder and fine suspension of cellulose hydrate was stored in the cooler for future use. The same product may be partly dried, ground in alcohol, and made into a fine powder." Water suspensions of this material were found not to settle out for some days, whereas the product prepared by means of the shorter method above described settled out in from 2 to 3 hours.

The yellow colouring matter of Khapli wheat (Triticum dicoccum), J. A. Anderson and A. G. Perkin (*Jour. Chem. Soc. [London], 1931, Oct., pp. 2624, 2625*).—A flavone-like coloring matter, present in slight amount in the leaves of this rust-resistant variety of wheat, has been isolated and described.

The yellow coloring matter of Khapli wheat (Triticum dicoccum), II, III, J. A. Anderson (*Canad. Jour. Res., 7 (1932), No. 3, pp. 285–292; 9 (1933), No. 1, pp. 80–83*).—Part 2 of the study noted above deals with the constitution of tricetin and part 3 with that of tricin.

A chemical study of rancidity.—III, Some recent developments in the study of oxidative rancidity of special interest to the cereal industry, H. O. Triebold, R. E. Webb, and W. J. Rudy (*Cereal Chem., 10 (1933), No. 4, pp. 263–276*).—The present addition to a series of papers (E.S.R., 69, p. 167) is contributed from the Pennsylvania State College, and discusses the following topics: Terminology, susceptibility of fats to oxidative rancidity, differences in susceptibility to oxidative rancidity between different types of fats, and individual fats of the same type, methods of determining the susceptibility of fats and crackers to oxidative rancidity, and the possibility of producing crackers of superior keeping quality from inferior shortenings. The present series of contributions is connected also with an earlier paper (E.S.R., 67, p. 359) of the senior author.

As was found in the work on commercial crackers noted earlier in the present series, experimental crackers examined in the trials here reported showed a close relationship between induction period and keeping quality. "The coefficient of rank of correlation found, +0.927±0.031, exemplifies the ability with which it is possible to rank the crackers in order of their keeping qualities, and emphasizes the fact that the determination of the length of induction period on crackers provides us with a rapid and yet accurate method for evaluating the keeping qualities of such baked goods."

With reference to the keeping properties of lards, it is noted that "there was a fairly close relationship between the keeping qualities of the lard samples at room temperature and at 40° C. This substantiates the practice of using a comparatively simple incubation test at an elevated temperature . . . for the rapid determination of the keeping quality of fats. A close relationship was also evidenced between the keeping quality of the lards at room temperature and the length of their induction periods which is in accordance with the generally accepted idea that the length of induction period of a fat is a good index of its keeping quality."

The free acidity and keeping quality of lards showed no definite correlation, and only a slight correlation between length of induction period and smoking temperature appeared. "A much closer relationship was exhibited, however, between the length of induction period and active oxygen values of the lards. It would be expected that the active oxygen (or peroxide) values, since they give an indication of the oxidizing potential already built up in the samples, would be closely related to the lengths of induction periods of the lards. Only two high active oxygen values were obtained among the samples . . . and these both had short induction periods. A good correlation was also experienced between the active oxygen and fat-aldehyde values. This would seem to indicate that in the early stages of oxidation, at least, the formation of aldehydes proceeds at a rate related in some measure to that of the peroxides. In these early stages of oxidation it should be possible then to test equally well for oxidative rancidity by means of either peroxide or aldehyde tests."

Concerning the production of crackers of good keeping quality from shortening of poor keeping quality, the authors state that "while this preliminary study would seem to indicate that it may be possible for a baker to use a lard shortening which is in the incipient stages of oxidative rancidity and yet produce crackers of good keeping quality, this is certainly not to be recommended as a general practice."

A group of substances, chemically of a widely various nature, but all capable of delaying the onset of oxidative rancidity in fats, are discussed under the designation "anti-oxygens." An inhibition of peroxide formation is considered probably an important factor in the action of these substances.

A discussion of the meaning of some terms used in cereal chemistry, Q. LANDIS and C. N. FREY (*Cereal Chem., 10 (1933), No. 4, pp. 330–346, figs. 3*).—Developing the thesis that "while cereal chemists have fairly definite concepts regarding the action of doughs, they differ in the use of the terms used to describe them", the authors present a general discussion under the heads fermentation relationships; response (development, tolerance, resistance); strength, stability, and quality; and bread characteristics (loaf volume, grain, and texture), followed by a section on definitions in which are stated definitions related to fermentation and definitions related to colloidal properties. Graphical and mathematical illustration is used in some cases.

An apparatus for the convenient and accurate delivery of solutions used in experimental baking tests, P. TALBOTT and R. WEAVER (*Cereal Chem., 10 (1933), No. 4, pp. 367–369, fig. 1*).—The apparatus reported upon in this contribution from the U.S.D.A. Bureaus of Plant Industry and of Agricultural Economics provides, according to the description and accompanying drawing, for the delivery from automatically refilled pipettes of potassium bromate solution, salt and sugar solution, yeast suspension from a supply vessel provided with a cooling coil and agitator and distilled water from a similarly cooled vessel, together with other conveniences for the rapid and accurate preparation of experimental doughs and batters.

The unsaponifiable lipids of beef liver, I, II, F. C. FREYTAG and H. G. SMITH (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 309–317, 319–322*).—Two papers are presented.

I. *Methods of separation; crystalline fractions.*—A method for the separation and fractionation of the solid and liquid portions of the unsaponifiable materials in beef liver lipids is described, with some of the characteristics of the crystalline fractions obtained. The method depends upon the differential solubilities in various organic solvents, including successively methyl alcohol, petroleum ether, acetone ether (after a resaponification), acetone, ethyl acetate, petroleum ether, and methyl alcohol. The entire procedure, with the yields of various fractions from a definite amount of crude unsaponifiable liquid, is presented in a diagram.

Sterols, chiefly cholesterol, with small amounts of dihydrocholesterol and ergosterol, constitute 64 percent of the unsaponifiable lipids. Small amounts of nitrogenous substances, among which lignoceryl sphingosine was identified, were isolated from the later fractions.

II. *Vitamins A and E; antioxygens.*—By means of the preferential solubility of vitamin A in methyl alcohol, concentrates were obtained in the fractionation of the unsaponifiable lipids of beef liver as described in the first paper which were from 100 to 500 times as rich in vitamin A as commercial cod-liver oil, as judged by the intensity of ultraviolet light absorption at 328 mμ. Comparable vitamin A tests on a cold ether extract of fresh beef liver subjected to a minimum of heat treatment showed that beef liver fat may contain 3 to 5 times as much vitamin A as cod-liver oil. "By vacuum distillation, vitamin A was concentrated in the lower boiling fractions but with destruction of as much as four fifths of the active material. Traces of antioxygenic material were present, but fractional vacuum distillation did not accomplish a concentration as is the case with vegetable lipid concentrates. Vitamin E was present in relatively minute quantities in the fraction comparable to that in which it is obtained from vegetable sources."

Adsorption experiments with vitamins B (B_1) and G (B_2), H. C. SHERMAN and N. HALLIDAY (*Jour. Amer. Chem. Soc., 55 (1933), No. 1, pp. 332–335*).—In this attempt at partial separation of vitamin B (B_1) and G (B_2), protein-free milk was used as the source of the vitamins and a preparation of Lloyd's reagent as the adsorbent. This was used in the proportion of 5, 10, 20, and 40 g per liter of the protein-free milk, which was prepared in the laboratory from skim milk powder and adjusted to pH 3 and pH 4. The original untreated protein-free milk, the activated Lloyd's reagent, and the filtrates remaining after adsorption were tested quantitatively for vitamin B by the methods developed in the senior author's laboratory (E.S.R., 66, p. 410).

The protein-free milk was found to contain practically all of the vitamin B and G potency of the skim milk powder from which it was obtained. Under the conditions of the experiment approximately one half of the vitamin B potency and one third of the vitamin G potency of the original protein-free milk was adsorbed on the Lloyd's reagent. The filtrates were practically free from vitamin B and had only about one sixth of the original vitamin G potency. Varying the proportion of Lloyd's reagent did not result in appreciable differences in the amount of either vitamin adsorbed. When the adsorption was carried out in an atmosphere of nitrogen instead of air, both the activated solids and the filtrates were somewhat more potent in both of the vitamins.

"In view of the recent evidence suggesting the multiple nature of both the more heat-labile and the more heat-stable components of the vitamin B complex, and in view of the further investigations of Halliday [E.S.R., 68, p. 279] and of Stiebeling [E.S.R., 68, p. 568], it is conceivable that some part of our apparent losses in vitamin potencies might possibly be due to a partial separation of the component factors of what are here treated as entities, i.e., vitamins B and G, respectively."

The extraction of the antineuritic vitamin (vitamin B_1) from dried brewers' yeast, A. SEIDELL (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 195–203*).—Attempts to increase the yield of antineuritic vitamin from brewers' yeast by extraction with other solvents than water and at the same time decrease the simultaneous extraction of nonactive material are reported.

Methyl alcohol, ethyl alcohol, and acetone in various concentrations, with and without the addition of a small amount of concentrated HCl, were used as the solvents, the extraction being carried on by percolation of dried brewers' yeast. It was found that with solvents containing more than 50 percent of either of the three organic solvents, the quantity of solids and of antineuritic vitamin removed depended principally upon the concentration and not upon the particular solvent employed. The water is considered to be the active extracting agent, with the organic constituents serving to prevent hydration and softening of the yeast. The addition of hydrochloric acid to the solvent increased considerably the percentage of vitamin extracted, but to an even greater degree other nonactive solids. It is thought probable that a solvent composed of 70 percent methyl alcohol, ethyl alcohol, or acetone acidified with 1 percent hydrochloric acid is the most satisfactory extraction agent. With 70 percent ethyl alcohol approximately 80 percent of the vitamin was extracted, together with only 10 percent of the yeast solids.

The differential extraction from dried brewers' yeast of the antineuritic (vitamin B_1) and growth-promoting (vitamin B_2) vitamins and their biological standardization, with a note on the relation of hemin to vitamin B_2, M. I. SMITH (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 225–235, figs. 2*).—This paper reports attempts to separate vitamins B (B_1) and G (B_2) from dried brewers' yeast by percolation with methyl alcohol, ethyl alcohol, and acetone in varying concentrations and with the addition of varying amounts of hydrochloric acid. The effect was also tested of adding 1 percent glacial acetic acid to 95 percent ethyl alcohol. Tests for vitamin B were carried out on the extracts by the author's injection method and for vitamin B_2 in the air-dried extracted material by the feeding method (E.S.R., 63, p. 291). In addition the extracted material was also fed to young rats at a 10 percent level incorporated in a basal ration free from the vitamin B complex.

Of the solvents tested, methyl alcohol with 5 percent HCl proved unsatisfactory in that it extracted both vitamins to about the same extent. The best results were obtained with 76 percent alcohol and 70 percent acetone plus 1 percent HCl. Either of these removed 80 percent or more of the available vitamin B_1 without extracting appreciable quantities of vitamin B_2. Further addition of HCl or further dilution with water increased the solubility for vitamin B_1, but at the expense of increasing the solubility for vitamin B_2.

The suggestion by W. Kollath[2] that the hemin that normally occurs in yeast is the antidermatitis factor was tested by the use of hemin or hematin as the sole source of vitamin G in feeding experiments with vitamin B supplied by intravenous injections of an active concentrate. Entirely negative results were obtained both as to growth and prevention of dermatitis.

A critical discussion on the B vitamins (vitamins B_1, B_2, and B_3) [trans. title], R. Lecoq (*Presse Méd.* [*Paris*], *41* (*1933*), *No. 66, pp. 1300–1304*).—Three vitamins are distinguished as comprising the original vitamin B—vitamin B_1, the antineuritic vitamin or vitamin of nerve equilibrium easily adsorbable by fuller's earth, thermolabile, and alkali-labile; vitamin B_3, the vitamin of nutritive utilization indispensable to the utilization by the organism of carbohydrates, proteins, and fats, less rapidly adsorbed by fuller's earth, quite stable to heat, but alkali-labile; and vitamin B_2, the antidermatitis vitamin or vitamin of cellular utilization, thermostable and alkali-stable. In the opinion of the author vitamin B_3 is identical with the B_3 of Williams and Waterman (E.S.R., 60, p. 293), the B_5 of Carter, Kinnersley, and Peters (E.S.R., 65, p. 593), and the B_4 of Reader (E.S.R., 64, p. 195). An extensive list of literature references is appended.

Survey of recent progress in the chemistry of vitamins: The antirachitic vitamin D [trans. title], P. Borgeaud (*Bul. Soc. Vaud. Sci. Nat.*, *58* (*1933*), *No. 232, pp. 17–32, figs. 2*).—A review of recent literature.

Indirect colorimetric method for the determination of calcium, E. M. Emmert (*Plant Physiol.*, *8* (*1933*), *No. 3, pp. 469–473*).—The author of this communication from the Kentucky Experiment Station proposes to separate calcium from magnesium, iron, and other elements on the basis of the lesser solubility of the triphosphate as compared with the hydroxide of calcium, and the reverse relationship between the phosphates and hydroxides of magnesium, iron, etc. He determines the total phosphate content of the unknown solution, adds a suitable quantity of phosphate, makes the solution alkaline by means of sodium hydroxide, and filters off the precipitated calcium phosphate. He then determines the excess of phosphate remaining in the filtrate and calculates the calcium to be determined from the quantity of phosphate found to have been removed from the solution. The Fiske and Subbarow colorimetric method (E.S.R., 55, p. 310) was used for the phosphate determinations.

It is noted (1) that the accuracy of the method depends on the correct adjustment of the phosphate concentrations, and (2) that the method is considered to be adapted especially for the determination of calcium in a series of samples which do not differ much in their calcium content.

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[2] Arch. Expt. Path. u. Pharmakol., 142 (1929), No. 1–2, pp. 86–110, figs. 2; 150 (1930), No. 3–4, pp. 236–255.

A method for the determination of the readily soluble phosphoric acid of cultivated soils [trans. title], H. EGNÉR (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 425* (*1932*), *pp. 36, figs. 8; Eng. abs., pp. 29–33*).—The paper is a report concerned in part with a retrial of a method using bicarbonate-carbon dioxide solution as extractant, this method having failed to give consistent results in all cases, and in part with the development of two methods using, respectively, sulfate and lactate solutions for the extraction of the phosphate. The lactate method appeared the more valuable and is described in detail. Special attention was given to the working out of technical aids to make the analysis of soils easier and cheaper.

Application of the sodium diethyldithiocarbamate reaction to the microcolorimetric determination of copper in organic substances, W. D. MCFARLANE (*Biochem. Jour.*, *26* (*1932*), *No. 4, pp. 1022–1033, fig. 1*).—Copper diethyldithiocarbamate was found to be much more readily soluble in amyl alcohol than in water, and the golden brown color of the salt was deeper in the organic solvent than in water. Amyl alcohol readily extracted the copper salt from its aqueous solution. The higher solubility of the copper salt in the organic solvent increased the range of concentrations within which the method could be applied, and the intensification of the color relative to that shown in aqueous solution improved the sensitiveness of the test. The depth of the color developed was found to be directly proportional to the quantity of copper present, "provided the range of copper concentrations is not too great."

In alkaline pyrophosphate solutions the reaction could be applied in the presence of iron. Copper sulfide could be oxidized without heating by means of saturated bromine water in the presence of 10 percent sulfuric acid to yield a solution suitable for use in the colorimetric determination.

A micro method based on the observations noted was shown to be satisfactory for the determination of minute quantities of copper in blood, milk, liver, crude glutamic acid, and crystalline hemoglobin.

Spectrophotometric determination of the carotinoid pigment content of wheat flour, C. G. FERRARI (*Cereal Chem.*, *10* (*1933*), *No. 4, pp. 277–286, figs. 5*).—Spectrophotometric equipment for quantitatively determining the carotinoid pigments of wheat flour is described. Construction of the mercury vapor light source is detailed, and a short discussion of the quality of illumination and light intensity is given.

A flour extract is prepared with a mixture of light cleaner's naphtha and absolute alcohol in the respective proportions of 93 parts to 7 parts by volume. The procedure described requires standing overnight, followed by centrifuging at high speed. Facilities for the routine handling of samples, including a convenient double compartment cell in which transmittancy measurements are made, is described. Readings are made with a Koenig-Martens spectrophotometer at wave lengths 435.8 mμ, with the pigment extract first in one beam and then in the other, using the first quadrant of the circular scale on the photometer. The larger angular reading is designated by θ_1 and the smaller by θ_2. Transmittancy is calculated with a special slide rule having a cotangent and tangent scale, or it may be calculated from the relation $T = \cot \theta_1 \tan \theta_2$. Transmittancy is related to carotene concentration, and the results are expressed as parts of carotene per million parts of flour.

AGRICULTURAL METEOROLOGY

Vertical distribution of the temperature of the air in the first two meters above the soil [trans. title], P. SELTZER (*Compt. Rend. Acad. Sci.* [*Paris*], *196* (*1933*), *No. 21, pp. 1626–1628, figs. 3; abs. in Sci. Abs., Sect. A—*

Phys., 36 (1933), No. 428, p. 842).—This is a brief account, illustrated by diagrams, of observations, about sunrise and sunset, on inversions of temperature near the ground under different meteorological conditions as affected by time of day, cloud, wind, and herbage. Considerable variations in temperature near the soil under different conditions were observed, and an attempt is made to explain them briefly.

Climatological data for the United States by sections, [March–April 1933] (*U.S.Dept.Agr., Weather Bur. Climat. Data, 20 (1933), Nos. 3, pp. [207], pls. 3, figs. 2; 4, pp. [202], pls. 3, figs. 2*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

SOILS—FERTILIZERS

A soil temperature installation, G. A. Mail (*Soil Sci., 35 (1933), No. 4, pp. 285–289, pl. 1, figs. 2*).—A contribution from the Montana Experiment Station describes a system of copper-constantan thermocouples of No. 32 copper and constantan wires protected by 7-in. lengths of $\frac{3}{16}$-in. copper tubing screwed at their open ends into a 1-in. hardwood board, through which the tubes project into the soil face. Details of the construction, wiring, instrument room, and the instruments used are given. A melting ice cold junction contained in a Dewar flask is used, together with a suitable potentiometer and galvanometer.

The dispersion of soil-forming aggregates, C. L. Clark (*Soil Sci., 35 (1933), No. 4, pp. 291–294; abs. in Utah Sta. Circ. 102 (1933), p. 10*).—"It would seem," according to the analysis of the problem presented, "that size distributions are comparable only when an inherent unambiguously particle set is placed in suspension in every case by the dispersion process. Such a set is assumed to be selected by the standard dispersion processes . . . but the reality of a complete deflocculation seems to be assumed rather than proved. . . .

"There seems to be ample justification for establishing mechanical analysis upon the functional relationship between dispersion processes and size distribution. It seems that the term duplicate may be defined in a practical way so that the arbitrary selection of a dispersion process specifies a particle size distribution for every soil. A unique particle distribution of any kind should be discerned from a study of this relationship."

Soil profile studies.—V, Mature podzols, J. S. Joffe and C. W. Watson (*Soil Sci., 35 (1933), No. 4, pp. 313–331, pl. 1*).—In the present installment of this serial contribution (E.S.R., 67, p. 213) from the New Jersey Experiment Stations, data on the morphology and chemical composition of two podsol profiles from the soils of the Lakewood series are presented. A distinctive morphological feature of these profiles is the almost complete absence of an A_0 layer. The distribution in the profile of the silica, sesquioxides, calcium, magnesium, and potassium is discussed.

"The importance of the movement of Al_2O_3 and Fe_2O_3 in the profile is pointed out. It is to be noted that some of the R_2O_3 constituents present in the A horizon indicate a slowing down of the decomposition of the mineral complexes, which is due to the circulation of bases. The Ca, Mg, and K behave somewhat alike with respect to their distribution in the soil profile. Ca shows a lower accumulation than Mg or K.

"The colloids from profile 2 have been extracted by the [U.S.D.A.] Bureau of Soils method. One of the most important features of the analyses of the colloid fraction is the $SiO_2:R_2O_3$ ratio, which approaches the figure 2 in the B horizon. In general, however, the analyses of the colloids supplement the data on the total analyses.

"The distribution of organic matter in the profile is obscured with respect to the A horizon because of the presence of charcoal due to forest fires. The C:N ratio is not 10, the commonly accepted figure. It is a good deal higher. It is low in A_2, increases in B, and drops in C. There is a high N content in the organic matter of A_2. It is pointed out that the type of organic matter varies in composition in the different horizons. It is suggested that the crenic and apocrenic acids in A_2 and the prevalence of fungi in A_2 might account for the high N content in the organic matter. There is also an accumulation of organic matter in the B horizon. . . .

"The soils investigated are mature podsols, and both profiles are identical except that profile 2 is shallower because of the geologic deposits of clay underlying the sandy parent material. This caused what was termed a 'stunting effect' on the growth of the soil body."

Availability to corn of nutrients in the A_2 and B horizons of Hillsdale loam, C. E. Millar (*Jour. Amer. Soc. Agron., 25 (1933), No. 6, pp. 418–426, figs. 5; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 45*).—Crop test experiments carried out by the Michigan Experiment Station in 10 by 24 in. glazed tiles and in greenhouse pots showed that the inferior growth of corn in soil from the A_2 and B horizons may be largely overcome by large additions of nitrogenous and phosphatic fertilizers. Little increased growth resulted from the addition of potassium salts. It was found essential that phosphate applications be heavy. In general corn grew as well when 8 in. of surface soil were under 24 in. of mixed A_2 and B horizon material as when the surface soil was above the mixture. Results obtained by adding 50 percent of quartz sand to soil from the A_2 and B horizons indicated that a poor physical condition tends to depress growth of corn in these soil materials.

The agrogeological soil types of the Vorstenlanden tobacco region [trans. title], D. Tollenaar (*Proefsta. Vorstenland. Tabak [Netherland East Indies], Meded. 73 (1932), pp. [2]+55, figs. 32; Eng. abs., pp. 51–53*).—The study of soil profiles in the district served by this station led to the following classification:

(1) Recent volcanic material of the Merapi (practically unweathered)—(a) recent andesitic ash (stones, gravel, sand, silt, clay); (2) weathered, older volcanic material of the Merapi—(a) andesitic dark gray clay, (b) young andesitic laterized soil, (c) aeolic andesitic ash, transported and deposited by rivers, and (d) andesitic brown dusty soil (beginning of laterization); (3) weathering forms of the tertiary Southern Range—(a) dacitic dark gray clay, (b) semimature dacitic laterite soil, and (c) semimature andesitic laterite soil; and (4) weathering forms of limestone and marly andesitic tuffs—(a) black limestone clay, (b) red limestone soil (Terra-rossa), (c) Rantja-minjak, kind of alkaline clay from marly tuffs, and (d) immature andesitic lateritic soil from tuffs.

The bulletin contains an introduction and sections on the more important agrogeological soil types, their origin and their distribution, and on the value of chemical soil analysis in connection with soil maps.

The soils and crop production in Genesee County, New York.—I, Soils and field crops, and appendix, A. F. Gustafson (*New York Cornell Sta. Bul. 567 (1933), pp. 5–31, 83–87, figs. 13*).—The section of the bulletin here dealt with takes up the climate, topography and drainage, soils, comparative land use and agriculture on the several soil areas in the county in 1931, crop adaptations, fertilizer, and lime needs of Genesee County soils, production and use of manure, and rotations and their fertilization. An appendix lists the soil series, types, and phases of types found in the county, with their aggregate areas, and the percentage of the total county area occupied by each; and presents an account of the topography and drainage conditions, together with a color-texture description of each of these soils.

The laws of soil colloidal behavior.—XI, Electrodialysis in relation to soil processes, S. Mattson (*Soil Sci., 36 (1933), No. 2, pp. 149–163, fig. 1*).—The electrodialysis of a soil does not, according to the observations recorded in the present installment of this serial contribution (E.S.R., 68, p. 739) from the New Jersey Experiment Stations, end with the removal of the exchangeable cations. After a certain degree of unsaturation has been attained, aluminum and iron (together with some associated silica) move toward the cathode, at first emerging into the cathode compartment (if the alkalinity there be not too high) and later building up a layer next to the cathode membrane which corresponds to the B horizon of the podsol profile. This layer becomes enriched in sesquioxides and prevents finally, by virtue of its high ultimate pH, the passage of aluminum and iron completely. If the polarity of the cell be reversed the sesquioxides reappear again in the cathode compartment until a new impermeable layer has been formed on the other side. This process can be repeated indefinitely. When a layer of aluminum hydroxide is interposed in a fourth compartment, no trace of aluminum and iron will reach the cathode compartment.

"The process is identical to podsolization and can be explained on the basis of the theory of isoelectric weathering. If the soil is maintained in a saturated condition by the continuous addition of NaOH to the anode compartment, silica and humus will move to the anode, whereas Al and Fe show no mobility in either direction. This process is identical to laterization.

"At low pH Al and Fe ionize and become mobile. At high pH silica and humus are ionized and become mobile. The strong bases are mobile at all pH values. The mobility of Mg has also been studied. The low displaceability of Mg is due to the stability of the silicate. The displaceability of the divalent cations from their silicates by NH_4Cl is Ba > Ca > Mg."

Soil organic matter requirements in general farming, A. W. Blair (*Jour. Amer. Soc. Agron., 25 (1933), No. 8, pp. 540–548*).—The author of this contribution from the New Jersey Experiment Stations recalls briefly some main points of Thorne's review (E.S.R., 56, p. 621) of work on the function of organic matter in the soil, and proceeds to an analysis of the results of 25 years' work at the New Jersey Experiment Stations, discussing the topics of fertilizer and manure treatments, the ability of chemical fertilizers to maintain yields, and rotation with legumes. He reaches the conclusion, among others, that "if in fertilizer practice, we will insist on meeting fully the mineral and nitrogen requirements of the crop, making allowance for losses, and see that the soil does not become overacid for the crops to be grown and that some legumes are included in the rotation, there need be no great anxiety about the supply of organic matter."

A comparative study of cropped and virgin soils, C. Dorman (*Soil Sci., 36 (1933), No. 2, pp. 101–119, pl. 1*).—This contribution from the Michigan Experiment Station reports upon comparative chemical examinations of cropped and of unbroken soils, and upon pot experiments carried out in conjunction with the chemical investigation.

With the exception of nitrogen content, which, with one exception, was higher in the virgin soils, a comparison of analyses of cropped and virgin soils showed no consistent differences. On the other hand, wide differences in the quantities of certain elements were noted in many instances within a given soil type.

In the lighter soil types phosphorus had been decreased by cropping, and in the heavier soil types increased by cropping. Very small differences in the exchangeable hydrogen of cropped and virgin soils were found. There had been no change in pH due to cropping. The content of the exchangeable bases calcium, magnesium, sodium, and potassium varied widely among the various soils. Five types showed an increase in base exchange capacity and total bases in the cropped soils, and two showed a decrease. The percentage of the total exchangeable bases increased as the soils became heavier. As the texture of the soil became finer the ratio of the calcium to the total bases and exchangeable cations decreased. With one exception the percentage of the total phosphorus found readily available was greater in the virgin soils. In all types studied the percentage of exchangeable calcium found readily available was greater in the cultivated soil. "This indicates that the calcium is held more firmly by the absorbing complex of the virgin soils."

In pot experiments the virgin soils gave greater plant growth under all treatments than did the cropped soils with similar treatments. Virgin soil checks gave an average increase of 99 percent plant growth over cropped soil checks for the two crops. Plant responses to phosphorus were in good agreement with laboratory determinations of readily available phosphorus. The cropped soils gave the greater response to nitrogen fertilization. Neither the cropped nor the virgin soils responded to potassium fertilization. The difference in yield between the cropped and the virgin soils was greater in the case of the second crop than in that of the first.

The influence of green manure and organic residues on nitrogen fixation in soil, S. V. Desai (*Indian Jour. Agr. Sci., 3 (1933), No. 2, pp. 301–319*).—Fine cut plant residues in the proportion of 2 g to each 100 g of the soil were shown to increase the activity of the nitrogen-fixing organisms of the soil. The fresh material produced a greater ultimate effect, though the soil nitrogen was as usual released in plant food form more quickly from prerotted material.

It was observed also that "the fermented tissues of nonleguminous plants are much more beneficial than those of leguminous plants for fixing atmospheric nitrogen. Artificial farmyard manure prepared by fermenting straw was found to fix in the soil a fairly large amount of nitrogen from the air and to benefit the plants."

The influence of a mulch on soil nitrates, A. B. Beaumont and G. C. Crooks (*Soil Sci., 36 (1933), No. 2, pp. 121–123*).—Further evidence (E.S.R., 58, p. 314) is presented from the Massachusetts Experiment Station concerning conditions surrounding the accumulation of soil nitrates under a mulch of waste hay and straw applied to the surface of the soil under apple trees.

"None of the mulch was incorporated in the soil by plowing or working in any manner. During the first three years of the experiment nitrates accumulated to a slight extent only. During the fourth year after the mulch was applied nitrates accumulated rather consistently, and often in large amounts. The hypothesis is advanced that nitrification occurs mainly in the lower, humified layer of the mulch in contact with the soil rather than in the soil proper, and, by leaching, the nitrates are carried into the soil. It appears that nitrates accumulate only after the carbon-nitrogen ratio has been narrowed by the processes of decay acting on the organic matter of the mulch."

Photonitrification in soil, N. R. Dhar, A. K. Bhattacharya, and N. N. Biswas (*Soil Sci., 35 (1933), No. 4, pp. 281–284*).—The authors of this contribution from the University of Allahabad, India, exposed solutions of ammonium sulfate, phosphate, and chloride mixed either with sterilized or with unsterilized soil to sunlight in the presence of air for periods of 160 and of 700 hours. In the case of the unsterilized soil the nitrification of ammonium sulfate after a longer exposure was 13.2 percent, that of the chloride 80 percent, and that of the phosphate 89 percent. Ammonium phosphate in sterilized soil under like conditions was oxidized during a 700-hour period to the extent of 85.8 percent. Except that less oxidation took place in the shorter period, the indications of the experiment continued for 160 hours were very similar to those of the longer exposure. When the mixtures were kept in the dark, either for the shorter or for the longer period, nitrification was very slight and in some cases practically none took place.

"It is evident from these and other experimental observations that nitrification in soil, especially in tropical countries, is a more photochemical than a bacterial process."

Nitrate reduction by Azotobacter, A. Itano and S. Arakawa (*Ber. Ōhara Inst. Landw. Forsch., 5 (1932), No. 2, pp. 281–289*).—*Azotobacter* was found generally to reduce nitrate to nitrite, but no definite evidence of reduction to ammonia could be obtained. The organism was found to utilize both nitrates and nitrites as sources of nitrogen. Glucose, fructose, galactose, sucrose, maltose, raffinose, starch, dextrin, inulin, mannite, sodium succinate, and sodium malate all stimulated the growth of *Azotobacter*, and all stimulated the nitrate reducing activity of the organism.

Nitrate reduction experiments are considered best performed in a synthetic nitrate agar medium containing either sodium succinate or sodium malate.

Investigation of cellulose decomposition in soils.—I, Re-examination of some stock cultures as to their physiological activities, A. Itano and S. Arakawa (*Ber. Ōhara Inst. Landw. Forsch., 5 (1932), No. 2, pp. 291–297, pls. 2*).—The clear zone which appeared about colonies of *Cellulomonas* growing on cellulose agar media was found to be due rather to enzyme action than to that of an acid produced by the organism.

The physiological activity of the *Cellulomonas* species investigated was found to be affected by the composition of the culture medium, organic nitrogen, which appeared best furnished by digested casein or by yeast extract, being required.

Several species of *Cellulomonas* were shown to have retained ability to decompose cellulose during a number of years of cultivation on a nutrient agar medium. The species *C. uda*, *C. fima*, and *C. gelida* were especially vigorous in this respect. The cellulose decomposing power of *C. cellasea* was somewhat weakened by the prolonged cultivation on agar.

An investigation of the distribution in Italian soils of aerobic Schizomycetes capable of decomposing cellulose [trans. title], T. Castelli (*Ann. Tec. Agr., 6 (1933), No. 3, I, pp. 246–261*).—A study of 115 soil samples from widely separated parts of Italy demonstrated a very general distribution of cellulosolytic aerobes isolable by the Winogradsky method. Only in 9 samples was the absence of this organism shown. The most widely distributed species, *Cytophaga hutchinsoni*, was present in 61.7 percent of the samples, and *Cellvibrio flavescens* was found in 52.1 percent. *Cyptohaga rubra*, *C. aurantiaca*, *C. tenuissima*, *Cellvibrio ochracea*, *Cellfalcicula viridis*, and *C. fusca* were but sparsely represented. The percentages especially of the two predominant species increased with a coarsening of the texture of the soil from that of clay to that of sand.

An application of the autocatalytic growth curve to microbial metabolism, H. C. Pulley and J. D. Greaves (*Jour. Bact., 24 (1932), No. 2, pp. 145–168, figs. 24; abs. in Utah Sta. Circ. 102 (1933), p. 7*).—Nitrification by mixed cultures of soil bacteria and the growth and carbon dioxide production shown by yeast cultures (*Saccharomyces cerevisiae* and commercial yeast culture) were found to fit the Robertson autocatalytic growth equation,

$$y=\frac{A\cdot 10_{K}(t-t_1)}{1-10_{K}(t-t_1)}$$

obtained from the rate equation, $\frac{dy}{dt}=Ky(a-y)$, of unimolecular autocatalyzed reactions; nitrification, carbon dioxide production, and growth rate following the equation closely. Carbon dioxide production appeared to proceed in a series of curves, each succeeding curve being more prolonged and of smaller magnitude than the first.

On the distribution of organic matter in the sea bottom and the chemical nature and origin of marine humus, S. A. Waksman (*Soil Sci., 36 (1933), No. 2, pp. 125–147, figs. 2*).—In a contribution from the New Jersey Experiment Stations report is made upon an investigation in the quantity, nature, and distribution of the organic matter content of marine mud sediments, and also of some sand bottom and deep ocean deposit materials. The suggestion is made that "the organic matter in the marine bottom be designated 'marine humus', to make it comparable to the soil humus, found in land soils."

The degree of abundance of the sea bottom humus content was found to vary considerably, depending on the distance from shore, the topography of the sea bottom, the nature of the inorganic residues, and the depth of the water. The humus content in the marine mud was found in general to diminish gradually with increasing depth of mud. "In some cases, however, the humus content may increase with depth, depending on the nature of the material deposited."

Marine humus was found to have a more or less constant ratio of carbon to nitrogen, ranging from 8 to 12 (the lower the humus content the wider the ratio), and to possess a very complex chemical composition. It could be separated into a number of fractions having distinctly different properties. Several such fractions were isolated. One, termed the "α-fraction", consisted predominantly of lignin and protein and was similar to a corresponding fraction isolated from land soil. Another, termed the "γ-fraction", was found largely a hemicellulose-protein complex.

"Humus is formed in the marine bottom as a result of bacterial decomposition of plant and animal residues of the sea. Close to shore it is partly of terrestrial and partly of marine origin. Marine humus is more resistant to further decomposition than are fresh plant and animal residues, especially at lower depths. In the presence of sufficient oxygen, the humus undergoes a process of slow decomposition, as shown by the liberation of a continuous stream of CO_2 and ammonia.

"It is suggested that the abundance of organic matter, or marine humus, in the sea bottom be measured by determining the total organic carbon by some convenient method and calculating the humus by the use of the factor 1.887."

The forest floor under stands of aspen and paper birch, F. J. Alway and J. Kittredge, Jr. (*Soil Sci., 35 (1933) No. 4, pp. 307–312*).—Under stands of aspen-paper birch, described in this contribution from the Minnesota Experiment Station as the most wide-spread type of forest in the Great Lakes region, the forest floor was sampled in nine places. The weight of this layer varied from 4 to 21 tons per acre, the content of volatile matter from 44 to 69 percent, and that of nitrogen from 0.87 to 1.63 percent, corresponding to from 2 to 12 tons of volatile matter or from 100 to 590 lb. of nitrogen per acre. The percentage of nitrogen in the volatile matter varied from 1.93 to 2.56. The pH values ranged from 5.2 to 6.4, the moisture equivalent from 82 to 144.

An observation on the behavior of soil under reforestation, C. E. Millar (*Soil Sci., 36 (1933), No. 2, pp. 97–99, pl. 1*).—Examining an area reputed to have been used for wheat growing, but now covered by trees largely of a uniform age of about 70 years and located in a tract of primeval forest, the author of this note contributed from the Michigan State College found a very thin litter accumulation and almost no F layer. The underlying soil was rich in humus to a depth of about 7 in., and had the typical granular structure of the plowed layer of a loam soil having a rather high content of organic matter. A few rods away primeval forest conditions were encountered, namely, a normal accumulation of litter, an F layer about 2 in. thick, an inch of humus layer below the F layer, and beneath this in turn a grayish podsolized horizon.

"From a soils standpoint the observation is of interest, since the failure to develop an appreciable layer of 'mold' during the period required for the growth of trees of the sizes mentioned [from 32 to 58 in. in circumference] gives some comprehension of the time required for the accumulation of 'mold' of the thickness usually found in areas bearing similar forest cover. The fact that the soil has retained a structure similar to that of plow soil and that during the period of reforestation no evidence of podsolization has appeared is also worthy of note, since it indicates that modification of soil characteristics as a result of forest growth is a very slow process."

Correction of the unproductivity of a peat soil for lettuce, B. D. Wilson and G. R. Townsend (*Jour. Amer. Soc. Agron., 25 (1933), No. 8, pp. 523–527, figs. 2*).—The peat soil upon which this investigation of the New York Cornell Experiment Station was carried out consisted, in its surface layer, "of well-decomposed woody-reed peat to a depth of 10 in. Below that level the soil is characterized by fibrous-reedy peat, yellowish-brown in color. The deposit, which is approximately 4 ft. deep, is underlain with grayish-blue clay that is noncalcareous." The reaction of this peat was found to be pH 4.8 and its calcium content 2.10 percent.

On this soil, though normal germination of lettuce seed could be obtained, the seedlings became chlorotic in from 2 to 3 weeks, with a concomitant development of necrotic spots at the leaf-tips, and curling and death of the leaves. No pathogenic organism being isolable, the condition was tentatively attributed to nutritional deficiency.

Liming the soil to pH 5.7 corrected the symptoms named, but damping-off appeared. Dusting the seed with copper oxide or treating the limed soil with copper sulfate increased germination, reduced the damping-off, and somewhat decreased the development of abnormal plants. The copper oxide dusting of the seed was more effective in these respects than was the soil treatment with copper sulfate.

The relation of soil acidity to the decomposition of organic residues, C. Thom and N. R. Smith (*Jour. Amer. Soc. Agron., 25 (1933), No. 6, pp. 392–396*).—Experimental work having the object of defining the relation of soil acidity to the decomposition of organic residues in or upon the soil is reviewed in a contribution from the U.S.D.A. Bureau of Chemistry and Soils.

"Total plate counts of micro-organisms in acid and limed plats of the same soil without other treatment show the general level of microbic activity in the limed plats to be about two to three times that of the acid plats. Organic remains upon the surface break down by aerobic activities which involve enormous numbers of bacteria, fungi, and other organisms, without correlated effects upon the micro-population of the underlying soil. Green manures plowed into soils in good tillable condition are broken down principally by bacterial activity without affecting or being affected by the acidity of the surrounding soil. Growing root systems surrounded by very narrow zones of microbic activity give pH tests at least partially independent of the adjacent soil, hence present biological conditions determined by their own acidity, rather than that of the soil."

On the nature of the reactions responsible for soil acidity.—Part II, Titration curves of silicic acid sol, humic acid sol, and aluminium hydroxide sol, J. N. Mukherjee, S. Roychoudhury, S. K. Dasgupta, and A. Chatterjee (*Indian Jour. Agr. Sci., 2 (1932), No. 6, pp. 638–666, figs. 15*).—In a contribution from the Calcutta University College of Science is given evidence, from an extension of work previously noted (E.S.R., 66, p. 716), indicating that in many respects colloidal silicic acid sols show the behavior of strong acids., "in some respects even as an acid stronger than the so-called strong acids." In some other ways silicic acid sols were found to have the character of a weak acid. Of these cases of seemingly anomalous strong acid behavior, it is noted that "as the distance between two particles is decreased by increasing the concentration, the H ions in the outer layer of one particle influence the distribution of H ions on the outer layer of other colloidal particles in such a way that the observed activity is much greater than what can be calculated from classical electro-chemistry. At higher concentrations of the colloidal particles, regions of the double layer overlap in such a way as to lead to the entrainment of a part of the free hydrogen ions and thus lead to a sharp change in the curvature indicating a rapid diminution of the observed activity of the hydrogen ions." Some other peculiarities of reactions involving interfaces are also pointed out; and it is shown that small quantities of electrolytes markedly affect the form of the titration curve of aluminum hydroxide sols.

The need in such measurements for a technic of improved accuracy, and especially for the exclusion of carbon dioxide, is demonstrated from experimental evidence; and experimental arrangements "which exclude carbon dioxide and oxygen and also allow simultaneous measurements necessary on theoretical grounds in such cases, but which have been so far overlooked in work with colloidal clay and soil", are described.

Methods for the determination of the fertilizer requirement of the soil, I, II [trans. title] (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 419 (1932), pp. 33, figs. 24; Eng. abs., pp. 30–32; No. 428 (1933), pp. 32, figs. 15; Eng. abs., pp. 27–31*).—These two papers are contributions from the Swedish Central Agricultural Experiment Station.

I. *The Mitscherlich and Neubauer methods in comparison with field experiments* [trans. title], G. Sundelin, O. Franck, and C. Larson.—In the interpretation of the results both of the Mitscherlich and of the Neubauer experiments (E.S.R., 50, p. 118), correction for the depth of the plowed layer was made on the assumption that the pots, after correction for the soil dilution, represented a plowed layer of 15 cm. The pot method was found to give results correlating excellently with those of the field experiments, so that not only qualitative indications but also a quantitative estimation of phosphate and potassium needs could be based upon such trials. In the use of the method as a qualitative test to show only the adequacy or inadequacy of the available potassium or phosphate content of the soil an accuracy of 94 percent was found in the phosphate test, with a corresponding figure of 90 percent for the potassium test.

The Neubauer results were found to correlate much less closely with the indications of the field trials than did those of the Mitscherlich method. Some definite significance could be attached to the Neubauer results, however. The

Neubauer figure ≦3 indicated a need for phosphate with an accuracy of 96 percent; a Neubauer figure of >5.5 indicated no immediate need of phosphatic fertilizer with an accuracy of 85 percent; with the Neubauer figure 24 or more, no potassium requirement was indicated with an accuracy of 89 percent. The Neubauer method did not, however, yield quantitative information with respect to the extent of the potassium requirement.

II. *Egnér's lactate method and Arrhenius' citric acid method for determining the phosphate fertilizer requirement as compared with field fertilizer experiments* [trans. title], O. Franck.—As compared with those of the lactate method, the results given by the citric acid method showed a very poor correlation with the field experiment indications. Failures to show correlation were so frequent and so marked that the author feels that the citric acid method cannot be regarded as giving in any individual case any definite indication as to whether the phosphatic fertilizer requirement is large or small. Fertility requirement maps and like data, when based upon the results given by the citric acid method, should be scrutinized most carefully and closely compared with the field trial indications. The lactate method, on the other hand, is considered capable of showing quite reliably any marked phosphatic fertilizer need; and this method was found a valuable supplement to field experiments.

A comparison of various methods for determining the fertilizer needs of certain soils, F. B. Smith, P. E. Brown, and O. R. Neal (*Jour. Amer. Soc. Agron., 25 (1933), No. 6, pp. 383–391, figs. 2*).—The authors of this contribution from the Iowa Experiment Station estimated the fertilizer needs of a Carrington loam soil by means of biological, chemical, and greenhouse test methods. They found, in part, that applications of sodium nitrate alone gave slight increases in the crop yield and brought about an increase in solubility of the soil phosphates; that 20 percent superphosphate gave increases in crop yields which varied directly with the amount of the application; and that applications of muriate of potash had no significant effect on crop yields on this particular soil.

"The growth of *A*[*spergillus*] *niger* was closely correlated with the amount of available phosphate as measured by the Truog method [E.S.R., 64, p. 312]. There was also a direct relationship between the amount of available phosphate and the crop yield. In general, the results secured with the *A. niger* method, the Neubauer test [E.S.R., 50, p. 118], and the Truog method for available phosphate agreed rather closely with the crop yields obtained in both greenhouse experiments. That is, increased crop yields were secured on those soils containing the larger amounts of available phosphate.

"The Carrington loam, under the conditions of this experiment, seemed to be adequately supplied with available nitrogen and potassium, but showed a deficiency in readily available phosphate for maximum plant growth."

Electrodialysis compared with the Neubauer method for determining mineral nutrient deficiencies in soils, P. H. Brewer and R. B. Rankin (*Jour. Amer. Soc. Agron., 25 (1933), No. 6, pp. 414–417, fig. 1*).—The authors of this contribution from the Indiana Experiment Station find, in part, that the Neubauer (E.S.R., 50, p. 118) and electrodialysis methods both give results agreeing more closely with those of pot and field plat experiments in the cases of some soils treated with heavy applications of phosphate rock than did the figures yielded by extraction with 0.2 N nitric acid and other purely chemical extraction methods. The Neubauer and electrodialysis methods gave closely agreeing results in the cases both of soils given heavy applications of phosphate rock and of soils given relatively large applications of superphosphate.

"One feature which commends the electrodialysis method is the relatively short time from the beginning of the dialysis until the determinations may be completed. Such period need not exceed 8 hours for the P_2O_5 determinations or 12 hours for the K_2O determination.

"The similarity of the amounts of potassium and phosphorus extracted by the two Bradfield cells when operating upon equal quantities of the same soil was in most cases quite remarkable. This was particularly true of potassium. The greatest variation in K_2O between any two duplicate dialyzates was 3.0 mg, while the majority varied less than 1 mg of K_2O."

Lysimeter experiments with sulphate of ammonia and nitrate of soda, T. L. Lyon and J. A. Bizzell (*Jour. Agr. Res.* [*U.S.*] *47* (*1933*), *No. 1, pp. 53–63*).—The relative effects of ammonium sulfate and sodium nitrate on the losses of nitrogen and calcium from a sandy soil were determined at the New York Cornell Experiment Station during a period of nine years. The average quantity of nitrogen removed annually in the drainage water was approximately 29 lb. to the acre for the soil treated with ammonium sulfate and 39 lb. from the soil that received sodium nitrate. The crops in the sodium nitrate tanks removed 108 lb. of nitrogen to the acre annually and the crops in the ammonium sulfate tanks 96 lb. Although larger crop yields were produced in the soil treated with sodium nitrate, these crops contained less calcium both in percentage and by weight than the crops from the soil treated with ammonium sulfate. The drainage water from the soil receiving ammonium sulfate contained more calcium than that from the soil receiving sodium nitrate.

Fixation and penetration of phosphates in Vermont soils, V. L. Weiser (*Vermont Sta. Bul. 356* (*1933*), *pp. 31, pls. 4*).—From laboratory, greenhouse, and field experiments were drawn the conclusions, among others, that penetration of soils by superphosphate may be increased by the addition of nitrates or sulfates of sodium, potassium, ammonium, also those of magnesium; that sodium phosphate, ammonium phosphate, and certain organic phosphates (e.g., glycerol phosphates) penetrate soils more readily than does superphosphate; and that exposure of superphosphate to a relatively large proportion of soil—as in the case of comparatively deep penetration—increases fixation.

"Vermont soils are comparatively high fixers of phosphorus, being sometimes as potent in this respect as are lateritic soils. This may be explained by the presence of much of the B horizon in the surface soil, due to the loss of a considerable portion of the A horizon through cultivation and erosion. . . . Certain hydrated oxides and precipitated salts of iron and aluminum fix large amounts of phosphorus. Certain silicates and minerals, as well as some sorts of organic matter, when applied to soils reduce their fixing power. Liming increases the ability of a crop to recover phosphorus. However, chemical studies indicate that liming may sometimes increase fixation. The influence of frequency of application on phosphate recovery was found to vary with the form of phosphatic fertilizer used. Recovery from sodium phosphate was greater when small and frequent applications were made, but recovery from superphosphate and Ammophos was greater when large and less frequent applications were made."

A comparison of certain methods for the determination of the potassic fertilizer requirements of cultivated soils [trans. title], F. Nydahl (*Meddel. Centralanst. Försöksv. Jordbruksomrädet* [*Sweden*], *No. 421* (*1932*), *pp. 26, figs. 15; Eng. abs., pp. 25, 26*).—Giving special attention to simplicity as well as reliability of experimental procedure, the author compared methods employing as extraction media N and 0.04 N ammonium chloride solutions, a solution normal with respect to acetic acid and 0.5 N with respect to ammonia, 0.1 N calcium chloride solution, calcium bicarbonate solution, and water. In addition to the results given by these solvents, Neubauer values for the root soluble potassium were determined; and the Mitscherlich figures and the data from field experiments already available were brought into comparison with the new figures.

The calcium chloride solution method was found the simplest and cheapest of the methods, which otherwise were very similar. The volume weight of the soils, the depths of the vegetable mold, the soil texture (mainly the clay content), and the pH value were found to influence the results. Chemical corrections for volume weight and vegetable mold depth were used. The method gave the same information as did the field experiments in the cases of from 70 to 85 percent of the soils examined on the basis and estimation of the best limit values. The water and calcium bicarbonate solution extraction methods gave indications agreeing with those of the field experiments in 73 percent of the cases.

A simple and rapid chemical test on plant material as an aid in determining potassium needs, S. F. THORNTON (*Indiana Sta. Bul. 384 (1933), pp. 20, figs. 9*).—A journal article fully covering the same subject has already been noted (E.S.R., 69, p. 780).

The Aspergillus niger method of measuring available potassium in soil, A. MEHLICH, T. TRUOG, and E. B. FRED (*Soil Sci., 35 (1933), No. 4, pp. 259–279, pl. 1, figs. 2*).—Of two strains of *A. niger*, one of them from a culture used by the originator of the Niklas method (E.S.R., 67, p. 652), the other a stock culture of the Wisconsin Experiment Station, from which the present paper is contributed, both gave satisfactory results. Some other strains of the same species did not show a sensitiveness to potassium deficiency sufficient to make them useful in soil testing. With the use of a suitable strain of the organism, however, the method was found applicable for the quantitative estimation of potassium availability, either by the analysis of the mycelium "or more conveniently by interpolation of the weight of the mycelium on a curve which has been especially constructed for this purpose." The results compared favorably with those of chemical methods of the Neubauer (E.S.R., 50, p. 118) and of other methods. "It is concluded that the test is simple and reliable and may be used in a practical way for the determination of potash needs of soils."

When the calcium carbonate content of the soil exceeded 1 percent (a simple method for determining soil calcium carbonate), the addition of acid sufficient to give a pH value optimal for mold spore germination and adequate to prevent bacterial growth became necessary. Various calcium, magnesium, and sodium salts, the anions associated with the potassium, and "minor soil constituents and stimulants", did not interfere seriously with the results.

The calcium-magnesium ratio in soils and its relation to crop growth, F. MOSER (*Jour. Amer. Soc. Agron., 25 (1933), No. 6, pp. 365–377*).—A contribution from the New York Cornell Experiment Station reports upon a study of soils used in a cylinder experiment in which there were wide differences between the total and the replaceable content of calcium and magnesium and the total amount of calcium and magnesium had no influence upon the amount held in replaceable form. The calcium-magnesium ratio, based on milliequivalents, of these soils varied from 0.23:1 to 2.50:1 when based on total content, but the ratios were from 1:1 to 4.50:1 when based on the replaceable amount. No significant correlation between the calcium-magnesium ratio and crop yields was found; the significant factor in determining yields was the quantity of active calcium in the soil.

The beneficial effect of adding lime to a soil was found due not to an alteration of the calcium-magnesium ratio but to an increase of the replaceable calcium content of a soil. "The increase of the replaceable cation content of any soil seemed to be determined largely by the type of carbonate added. Pure magnesite markedly increased the replaceable magnesium content with no appreciable effect on replaceable calcium, while pure calcium carbonate increased only the replaceable calcium content. However, the limestone added in the cylinder experiment increased slightly the replaceable magnesium, but some magnesium was accidentally carried as an impurity of the limestone.

"The study of the lysimeter soils gave results similar to those obtained in the cylinder experiment, namely, there was no correlation between the total, the replaceable, and the water-soluble calcium and magnesium of a soil."

The rates of reaction with acid soils of finely divided soil liming materials, W. H. Metzger (*Jour. Amer. Soc. Agron., 25 (1933), No. 6, pp. 377–383*).—A doctorate thesis contributed from the Ohio Experiment Station presents the results of a study of the reaction rates of four finely divided liming materials with two acid soils. The materials included were hydrated lime, pulverized high calcium limestone, pulverized dolomitic limestone, and a by-product precipitated calcium carbonate known commercially as "Plant Lime." All materials were employed at three rates of application and in chemically equivalent amounts. Change in pH, decrease in Jones lime requirement, and decrease in total carbonates were used as criteria of rate of reaction. The incubation periods varied from 1 week to 1 year.

Both pH change and decrease in lime requirement proved unreliable indicators of rate of reaction. The former remained approximately constant after 1 week. Lime requirement reached a minimum in 1 or 2 weeks and thereafter showed a material increase.

"Based upon the disappearance of carbonates, hydrated lime and the precipitated carbonate were about equally rapid in reaction. The precipitated carbonate reacted faster than the high calcium limestone. The difference can probably be accounted for by the somewhat greater fineness of the former. The dolomitic limestone was measurably less active than the high calcium limestone, the difference largely disappearing after 2 months' incubation. It is doubtful whether any practical significance may be attributed to the differences in rates of reaction among the materials studied."

Correcting the unproductiveness of acid and alkaline muck soils for the growing of vegetable crops, G. M. Tait and J. E. Knott (*New York Cornell Sta. Bul. 572 (1933), pp. 19, figs. 10*).—From a study of the agricultural possibilities of the muck soils of New York, the authors draw the conclusions, among others, that the clearing of a muck soil for cultivation is of doubtful wisdom if the soil be found to have no underlying calcareous layer. Liming may be required rather frequently, and if the initial pH value is as low as 4.0 limestone amounting to 8 tons to the acre may be required as a first application.

When, on the other hand, the reaction of the surface soil was between pH 6 and pH 7, it was found needful to insure that the marl thrown from drainage ditches be removed without permitting it to become scattered on the fields. In some cases alkaline spots could be corrected by deep plowing, penetrating to subsoil of acid reaction. Alkalinity due to springs was found best dealt with by providing better drainage. In either of these cases the remedy named is considered much superior to the use of sulfur to correct the alkalinity. The need for working shallow muck deposits over marl with care to avoid mixing the underlying alkalinifying material with the soil proper is noted. Neglect of this precaution produced such an alkalinity as to require very heavy sulfur applications for its correction.

Where sulfur treatment was necessary, the element in its ordinary form was as effective as was the inoculated preparation. "If sulfur must be used, an application at the rate of 2,000 lb. to the acre should be enough. This may be applied in two installments, and the muck plowed after the bacteria have had an opportunity to utilize the first 1,000 lb."

The pH range within which optimum growth of various crops may be expected is briefly discussed. In general "the optimum soil reaction for vegetable crops on muck soil was found to be an optimum range, and there is no reason, from the crop-yield standpoint, for a grower to be concerned about the reaction of his muck unless it is approaching the extremes of this range, with pH 7.0, or neutrality, on one end and pH 5.0 on the other."

AGRICULTURAL BOTANY

Plants useful to man, W. W. Robbins and F. Ramaley (*Philadelphia: P. Blakiston's Son & Co. 1933, pp. VII+428, figs. 241*).—The aim of the authors has been to supplement the usual textbooks and to furnish a background of the knowledge of the world's commercial plant products for students of botany and those interested in the fields of geography, economics, and agriculture. The book includes a discussion of the common crop plants of orchard, garden, and field grown within the United States and also of the more usual ornamentals. Plants of tropical and subtropical countries yielding such products as tea, coffee, spices, drugs, fibers, and tropical fruits, and industrial products of vegetable origin are also included in the discussion. Introductory chapters deal with sources of cultivated plants, classification and naming of plants, and with the lower plant groups. Part of the material is adapted from Botany of Crop Plants, by the senior author (E.S.R., 37, p. 818).

A bibliography of general works for reading and references is appended.

Textbook of ecological plant geography, E. Warming and P. Graebner (*Lehrbuch der ökologischen Pflanzengeographie. Berlin: Borntraeger Bros., 1933, 4. ed., pp. VIII+1158, figs. 468*).—The main sections of this comprehensive monograph deal with the stand (station, habitat): The ecological factors and their various modes of action—climatic and edaphic factors, and water as a habitat; life forms; associations of organisms, social adaptations, and the plant society; halophyte series; fresh-water associations; mesophyll and hygrophyll formations; peat soil formations; tundras; lithophilous and psammophilous associations; sclerophyllous vegetation zones of the winter rain regions; subxerophilous formations with grassland soils; and arid regions (deserts). The final section takes up the struggle for existence among plant societies. The work is provided with a bibliography of approximately 10 pages and with a comprehensive subject index.

Tannin-producing plants of Abkhasia [trans. title], A. I͡anson (Yanson) (*Sovet Subtrop. (Soviet Subtrop.), 4 (1932), No. 2 (12), pp. 95–119, figs. 4*).—Information is presented on the tannin content of the wood, bark, and leaves of 193 trees and shrubs, samples from which were collected in spring, summer, and fall from locations differing with respect to elevation, exposure, etc.

Rubber producing plants in Crimea [trans. title], V. F. Vasil'ev (Vassiliev) (*Sovet Subtrop. (Soviet Subtrop.), 4 (1932), No. 2 (12), pp. 9–17*).—Determinations of the rubber content of some 150 species of plants of the Crimea region showed positive results in some 80 instances. The most promising species were *Taraxacum gymnanthum* with 3.5 percent of rubber in the roots and *Cynanchum acutum* with 3.5 percent in the entire plant. *Scorzonera tau-sagiz*, a species from Central Asia, had a rubber content ranging from 14 to 30 percent.

Wild flowers of North Dakota, O. A. Stevens (*North Dakota Sta. Bul. 269 (1933), pp. 51, figs. 38*).—Following a discussion of the different locations in which wild flowers flourish, descriptions are presented of a large number of species, with suggestions as to their natural habitat. Tables are included showing the time of bloom of the various species and their grouping by flower color.

Comparative responses of long-day and short-day plants to relative length of day and night, W. W. Garner (*Plant Physiol., 8 (1933), No. 3, pp. 347–356*).—The discussion deals primarily with the problem of satisfactorily classifying plants into the long-day, short-day, and indeterminate or neutral groups on the basis of response to relative length of day and night.

In the first two groups there exists a fairly definite critical light period which constitutes the dividing line between day lengths favorable to flowering and fruiting and those tending to produce a purely vegetative type of activity. Short-day plants are those in which reproductive activity is favored by day lengths shorter than the critical, and long-day plants are those in which reproduction is promoted by day lengths in excess of the critical. Among annuals and herbaceous perennials the alternative vegetative stage in the short-day type commonly is characterized by extensive elongation of the axis, while usually a prominent feature of the vegetative stage in long-day plants is a leaf-rosette form of growth.

Plants of the less sensitive or indeterminate group have no clearly defined critical light period. Long-day and short-day plants show definite contrast in their responses to abnormal light periods with respect to initiation of reproductive activity but not as to maintenance of the general nutrition.—(*Courtesy Biol. Abs.*)

A working bibliography of day-length and artificial illumination as affecting growth of seed plants, F. Ramaley (*Colo. Univ. Bul. 322 (1933), pp. 257–263*).—This is a selected bibliography of 134 titles.

Study of the products of photosynthesis in leaves in artificial and in natural light, R. H. Dastur and K. M. Samant (*Ann. Bot.* [*London*], *47 (1933), No. 186, pp. 295–304, fig. 1*).—The nature and quantities of the different carbohydrates formed in leaves exposed to artificial light (gas-filled electric lamp over a water screen) and to diffused sunlight, and under uniform and comparable conditions of experimentation, were determined in experiments on *Helianthus annuus, Abutilon asiaticum, Ricinus communis, Phaseolus vulgaris,* and *Allium cepa.* A colorimetric method was used for sugar determination.

With starch-forming leaves, the starch formed in artificial light is only about one third of the amount formed in the natural light. The sucrose formed under both conditions is approximately equal. The total carbohydrates formed under artificial light are less than one half of those formed in the diffused sunlight. That the increased formation of carbohydrates in the diffused sunlight is not due to the increased formation of starch can be seen from the results obtained with the leaves of onion (*A. cepa*), which does not produce starch. In the leaves of this plant the total amount of sugar in the diffused sunlight is over three times that in artificial light. The differences in the amounts of total carbohydrates are not due to the differences in the total intensity of the two lights, but are due to the differences in the quality of the radiation.—(*Courtesy Biol. Abs.*)

Effect of phosphorescent light on plants [trans. title], A. Biraghi (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 13 (1933), No. 2, pp. 181–189, fig. 1; Eng. abs., pp. 187, 188*).—A study on the effect of phosphorescent light on the development of wheat seedlings is described. The results have shown that the seedlings after exposure of 12 days to phosphorescent light did not differ from those grown in perfect darkness. Probably these results depend upon the low intensity of the light that did not reach the minimum necessary to determine the synthesis of carbohydrates.

Changes in leaves during the period preceding frost, F. E. Denny (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 297–312, figs. 2*).—Samples of 50 pairs of opposite leaves of *Viburnum dentatum* and *Syringa vulgaris* were selected to measure the changes in leaves at intervals of 3 to 5 days from September 24 to November 4, at which time the experiment was ended because of frost. One leaf of each pair was taken at the beginning and the other was left on the plant until the end of each interval, there being 10 such intervals during the experimental period. Calculations were made upon three bases: Percentage of the dry weight, percentage of the residual dry weight (obtained by subtracting from the dry weight the sum of the carbohydrates and 6.25 times the nitrogen), and the total amounts of constituents in 50 leaves.

The dry weight of the leaves was nearly constant throughout the period of sampling, and no important change was observed in total carbohydrate (sum of sugar and polysaccharide). Previous reports of extensive losses of substances from leaves during the interval preceding frost (autumnal migration) were confirmed only for the nitrogenous substances in these species, and, even in this case, only the *Viburnum* results should be emphasized, as the nitrogen losses from lilac were small and of doubtful significance.—(*Courtesy Biol. Abs.*)

Modifications of the reserve function of vegetables subjected to intermittent drying [trans. title], L. Daniel (*Compt. Rend. Acad. Sci. [Paris], 196 (1933), No. 2, pp. 79–82, figs. 2*).—Kohlrabi and radish were subjected to abrupt transitions from dryness to humidness and vice versa during the course of active vegetation. With such treatment both types reproduced additional storage organs like their first and just below them.

"Growth-promoting substance" and elongation of roots, A. E. Navez (*Jour. Gen. Physiol., 16 (1933), No. 5, pp. 733–739, figs. 2*).—The vertical elongation of normal roots of *Lupinus albus* seedlings proceeds at constant rate over periods of 4 to 5 hours. The decapitation of a root stops its elongation for a variable length of time, followed by a period of renewed elongation at a rate lower than that of the normal root. The tipping of the decapitated root with a tip of a coleoptile of *Zea* induces a decrease in the rate of elongation of the root. The same effect can be obtained with the diffusate from tips of coleoptile of *Avena* and to a lesser extent with diffusate of root tips. The reduction in the rate of elongation of the root determined by diffusate from the lower half of the tip of a coleoptile placed horizontally is more pronounced than the inhibition elicited by the diffusate of the upper half of the same tip. Various experiments with the diffusate of tips support the idea that under the conditions used the growth-promoting substance of the coleoptile tip or root tip inhibits the elongation of the decapitated root.

Initiation and stimulation of adventitious roots caused by unsaturated hydrocarbon gases, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 351–369, figs. 10*).—Twenty-seven species and varieties of plants were subjected to low concentrations of unsaturated hydrocarbon gases, ethylene, acetylene, and propylene to determine the capacity of these chemicals to initiate or stimulate growth of adventitious roots on stems and leaves. Fifteen of the species showed definite rooting responses of some sort. The most effective concentrations of the gases ranged as follows: Ethylene 0.2 to 0.001 percent, acetylene 1 to 0.1, and propylene 1 to 0.1 percent. Due to the large number of variables involved, the optimum concentrations were not determined.

The best method for exposure was to enclose the plants in glass cases with the gas for two days, then rest the plant for two days, and continue this procedure until the desired results were obtained. During the rest periods the plants were left in the cages without the gas. *Nicotiana tabacum* and *Hydrangea macrophylla* responded by producing roots from only a short zone back of the growing point, representing the region of elongation at the time the experiment was started.

When induced adventitious roots were allowed to grow under control conditions for several days, and were then transferred to cages containing the gases, root hairs were produced in abundance from the regions of elongation. This treatment also changed the normal orientation of roots to gravity. The majority of plants tested produced roots somewhat generally over the stem from base toward the tip. Leaves of four species were forced to root from veins on the lower side of the blades. In no case were adventitious shoots induced to form, and for this reason the three chemicals are thought to be specific for adventitious root formation.—(*Courtesy Biol. Abs.*)

Effect of thallium sulfate on the growth of several plants and on nitrification in soils, M. M. McCool (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 289–296, figs. 4*).—The presence of 2.1 parts of thallium sulfate in 1,000,000 parts of sandy loam slightly retarded the root and top development of soybean, wheat, buckwheat, alfalfa, and ryegrass, and 8.5 parts of this salt in 1,000,000 parts of soil were very injurious to these plants. Similar relationships occurred with corn, tobacco, and tomato plants. Wax bean was more resistant. The injury to corn leaves was of the intraveinal type, that of soybean, wax bean, and buckwheat veinal, that of rye and wheat general, and that of alfalfa basal.

The extent of injury due to the thallium sulfate was greatest in the soils having the lowest base exchange capacity and least in those having the highest. Much larger quantities of thallium sulfate were required to reduce nitrification in soils than were found to injure plants. Except where thallium injury was slight, lime and commercial fertilizer did not lower the injurious action of the thallium sulfate. Leaching thallium-treated soils with large quantities of water did not prevent the deleterious action of the thallium.—(*Courtesy Biol. Abs.*)

Effect of potassium thiocyanate and ethylene chlorohydrin upon amylase activity, F. E. Denny (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 441–450, figs. 3*).—The effect of 2.4 g of KSCN per 100 cc of reaction mixture depended upon the pH. In the acid range of each amylase preparation KSCN strongly retarded; at intermediate values of the pH range it had no effect; and in the alkaline range it increased the amylase activity of pancreatin, pangestin, and malt diastase and had no effect upon taka-diastase and barley extract. Addition of 0.1 g of NaCl per 100 cc of reaction mixture decreased the activity of the barley extract, but if KSCN was added simultaneously this retarding action of NaCl was nullified. Ethylene chlorohydrin in amounts up to 2.5 cc of the constant-boiling 40 percent solution per 100 cc of reaction mixture had no important effect upon any of the amylases tested, at any pH value, whether NaCl was present or absent.—(*Courtesy Biol. Abs.*)

Apparatus for making autographic records of catalase activity of plant tissues and the procedure involved, A. J. Heinicke (*Jour. Agr. Res. [U.S.], 46 (1933), No. 12, pp. 1137–1143, figs. 3*).—A discussion is presented of the construction and operation of an apparatus devised at Cornell University and capable of determining simultaneously the catalase activity of 12 different samples of plant tissue with an autographic record of results in each case. Obviously there is a great saving of time wherever numerous determinations must be made at frequent intervals. The graphic records are said to afford an accurate and convenient means of comparing catalase activity of different tissues.

Influence of magnesium on the growth of fungi [trans. title], D. Rabinovitz-Sereni (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 13* (*1933*), *No. 2, pp. 203–226; Eng. abs., p. 225*).—*Penicillium glaucum, Botrytis cinerea*, and *Alternaria tenuis* fail to grow in nutrient media without magnesium. With traces of it, they grow but do not produce spores. The addition of 0.04 percent of magnesium sulfate produces an increase in dry weight, as well as a stimulating effect on the production and abundance of spores. Respiration increases also, as well as the sugar consumption and acidification of the nutrient solution. These fungi were very tolerant to large quantities of magnesium, reaching, as a maximum of tolerance, 40 percent of magnesium sulfate. The tolerating effect is due to the limited absorption of magnesium salts, and the toxic action on fungus growth is due only to high osmotic pressure.

The action of certain alkaloids on the metabolism of glucides by Aspergillus niger [trans. title], G. Mezzadroli and A. Amati (*Gior. Biol. Appl. Indus. Chim. ed Aliment., 3* (*1933*), *No. 3, pp. 81–92*).—The authors tested the action of strychnine, caffeine, and quinine on the metabolism of glucides by *A. niger* cultivated in fluids of the Wehmer type and in Raulin's solution at 30° and at 37°, with sucrose and glucose glucides added. Strychnine nitrate at doses of 0.5 to 2 percent favored the assimilation of glucides by *A. niger* and regulated their metabolism. Quinine sulfate at doses of 0.5 to 3 percent favored the metabolism of glucides, rendering it even more active than the preceding alkaloid. Pure caffeine, under the above conditions (0.5, 1, 2, 3 percent), modified markedly the metabolism of the glucides, slowing it up, as opposed to the other two alkaloids. The composition of the nutritive fluid, temperature of incubation, or quality of carbohydrate in general did not influence the action of the alkaloids tested on the assimilation of the glucides by *A. niger*.

Macrosporogenesis and embryology of Melilotus, D. C. Cooper (*Bot. Gaz., 95* (*1933*), *No. 1, pp. 143–155, pls. 2*).—Studies at the Wisconsin Experiment Station, largely with Redfield Yellow sweetclover (possibly derived from *M. alba* × *M. officinalis*), showed that in *Melilotus* a single apical hypodermal cell is differentiated in the young ovule as an archesporial cell, which divides to form a primary parietal and a primary sporogenous cell. The primary sporogenous cell functions as the macrospore mother cell in *M. officinalis* and in Redfield Yellow. From 1 to 3 sporogenous cells are usually formed in *M. alba*, but only 1 undergoes further development. In consequence of 2 divisions, the macrospore mother cell produces a row of 4 macrospores, the chalazal one developing into a 7-celled embryo sac of the usual type and the other 3 disintegrating. The micropylar end of the nucellus breaks down and the embryo sac elongates greatly, the basal portion becoming deeply imbedded in the nucellus and the apical portion extending so as to lie in direct contact with the inner integument. The polar nuclei fuse and the fusion nucleus comes to lie just basal to the egg apparatus. The antipodal cells disintegrate just prior to fertilization. The apices of the synergids elongate and a distinct filiform apparatus is produced. The pollen tube enters the embryo sac between the synergids and the egg, and the synergids are rarely broken down in consequence of fertilization but persist for some time thereafter.

Fertilization occurs under greenhouse conditions between 18 and 21 hours after pollination. The zygote, by transverse divisions, forms a filament of 3 or 4 cells. The terminal cell of this filament forms the embryo. The basal cells by further divisions form a multicellular suspensor. The primary endosperm nucleus divides before the zygote, and there are usually 4 or more free nuclei in the embryo sac at the time of division of the zygote. Cell division in the endosperm begins in the region of the suspensor at about the time the embryo has reached the 16-celled stage. The endosperm is entirely absorbed by the time the embryo is mature.

The haploid number of chromosomes is 8, and *M. alba* and Redfield Yellow each have 1 pair of satellite chromosomes.

GENETICS

Heritable characters of maize, XLIII–XLV (*Jour. Heredity, 23 (1932), No. 10, pp. 415–419, figs. 2; 24 (1933), Nos. 1, pp. 41–46, figs. 3; 7, pp. 279–282, fig. 1*).—The series (E.S.R., 66, p. 421) is continued.

XLIII. *Zebra seedlings*, H. K. Hayes.—Zebra seedling zb_3, which behaves as a simple recessive to normal, appeared in a selfed line of Longfellow yellow flint at the Minnesota Experiment Station. It closely resembles zebra plant described by Demerec (E.S.R., 49, p. 632). Characteristic irregular cross bands appear on the leaves when the seedlings reach the 2- or 3-leaf stage, but disappear entirely before maturity is reached. Fluctuations in temperature facilitate its expression. Zebra seemed to be inherited independently from the aleurone color factors, *Prpr*, *Rr*, and *Aa*, and also of the factor pairs *Yy*, *Flfl*, and *Lglg*.

XLIV. *Silky ears*, A. C. Fraser.—Several ears appearing in genetic studies with corn at Cornell University had silks which did not break away as usual in husking but remained firmly attached. In silky I (si_1), silks appear in great numbers from between the rows and between the kernels in the row. The extra silks arise chiefly from the second flower of the spikelet. The general effect of the silky gene or genes, both in this and other types of silkies, is to make the plant almost entirely pistillate, at least in function. Silky seemed to differ from nonsilky by a single recessive gene (Si_1) which belongs to the *Y-Pl* linkage group, and is independent of *A*, *C*, *R*, *Pr*, *B*, *Lg*, and *Sh*. Other silkies, *si* IV and *si* V, were found to be identical with or at least allelomorphic to *si* I, while strains of silkies II, III, and X were not allelomorphic to *si* I. Silkies II and III were found to be genetically identical and phenotypically indistinguishable. In this type clumps of silks and glume-like tissue appear at several places on the ear.

XLV. *Nana*, H. W. Li.—Nana (*na*), a recessive type of dwarf corn plant described by Hutchison (E.S.R., 49, p. 32), was determined in Cornell University studies to be in the A—ts_4 chromosome, possibly located between these two factors. The recombination percentage of *A* and *na* was 35.5±0.87. Nana was found to be independent of *C*, *sh*, *wx*, *R*, *g*, *su*, *Tu*, *B*, *lg*, *Y*, *Pl*, *f*, *ts*, *ra*, *gl*, *pr*, v_4, *bv*, and d_1.

Pseudo-black chaff of Reward wheat, W. C. Broadfoot and H. T. Robertson (*Sci. Agr., 13 (1933), No. 8, pp. 512–514, pl. 1*).—Characters distinguishing pseudoblack chaff and true black chaff are given. Tests for systemic or nonsystemic nature of the causal agent proved negative. Histological examination showed the tissues of the discolored areas to be free from fungal threads or bacterial invasion and to be similar to those of normal black pigmented areas in Kahla. Since the intensity of the discoloration varied with the time of planting, it appears that the best explanation for pseudoblack chaff is that some strains of Reward still carry color factors, which, under suitable environment, principally light intensity, produce the dark pigmented areas mentioned.—(*Courtesy Biol. Abs.*)

Inheritance of reaction to stem rust and barbing of awns in barley crosses, L. Powers and L. Hines (*Jour. Agr. Res.* [*U.S.*], *46 (1933), No. 12, pp. 1121–1129, figs. 2*).—The transmission of reaction to stem rust (*Puccinia* *graminis tritici*) in a cross between susceptible and resistant barley varieties was studied at the Minnesota Experiment Station in cooperation with the U.S. Department of Agriculture. Efforts were made to determine the number of factor pairs differentiating resistance and susceptibility, and whether these factors are inherited independently of *Rr* for rough and smooth awn.

The physiologic forms of *P. graminis tritici* causing the stem rust were found to be nos. 17, 38, and 49. Resistance was found to be dominant to susceptibility. The reaction to stem rust of the resistant Peatland and the susceptible Glabron was differentiated by a single factor pair, *Tt*. Analysis of F_2 genotypes and of 10 F_3 families, segregating for *Rr* and *Tt*, showed that these two factor pairs are not linked. Conclusions were that since reaction to stem rust is differentiated in this manner and not linked genetically with barbing of awns, it should be relatively easy to produce a smooth-awned, high-yielding barley resistant to stem rust physiologic forms nos. 17, 38, and 49.

Inheritance of stem-rust reaction in wheat, J. A. Clark and H. B. Humphrey (*Jour. Amer. Soc. Agron., 25 (1933), No. 8, pp. 497–511, figs. 3*).—Earlier data on crosses of Hope × Marquis and Hope × Reliance were interpreted to show that the inheritance of the three stem rust reactions, i.e., near immunity, resistance, and susceptibility, was controlled by two genetic factor pairs. Data on a H-44 × Ceres cross studied by the U.S. Department of Agriculture in cooperation with the North Dakota Experiment Station showed a segregation resembling that previously obtained in Hope × Marquis and Hope × Reliance. These results were interpreted as showing that Hope possesses a single dominant inhibiting factor for near immunity, that Marquis and Reliance have a dominant factor of susceptibility, that H-44 carries both of these dominant factors, and that the resistant Ceres carries the double recessives. See also an earlier note (E.S.R., 59, p. 128).

Inheritance of reaction of wheat to physiologic forms of Tilletia levis and T. tritici, W. K. Smith (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 2, pp. 89–105, figs. 2*).—Hope, a spring common wheat (*Triticum vulgare*), which when spring sown is highly resistant to 3 physiologic forms (T–1, T–2, T–3) of *Tilletia tritici* and 2 forms (L–4, L–5) of *T. levis*, but when fall sown is susceptible to the 5 forms, was crossed by the U.S. Department of Agriculture cooperating with the Washington Experiment Station with Jenkin, a spring club wheat (*Triticum compactum*) susceptible to the 5 forms. One of 3 parts of the seed of each of 195 F_2 plants was inoculated with T–3, a second part with L–5, and the third with a mixture of T–1, T–2, and L–4. The factors in Hope for resistance to any one of the 5 forms seemed to be the same as those for resistance to any of the others. The results could be explained on the basis of 3 main factors for resistance, with no indication of dominance of either resistance or susceptibility.

In the case of crosses between Hope and White Odessa or Ridit winter wheats, F_3 progenies were tested with L–4, to which White Odessa is moderately resistant and Ridit highly resistant, and part of each progeny was sown in the fall and spring, respectively. There was little trace of bunt in spring-sown series, indicating that White Odessa and Ridit carry at least some of the same factors as Hope for resistance to L–4 in spring sowing. Hope in reaction to L–4 in fall sowing seemed to differ from Ridit by a single main factor. In the 3 crosses linkage was not evident between the factor or factors for reaction to bunt and those for length of awn, color of glume, and winter or spring growth habit.

Bud variation in the Agen prune, A. D. Shamel, C. S. Pomeroy, R. E. Caryl, and F. N. Harmon (*Jour. Heredity, 24 (1933), No. 7, pp. 288–292, fig. 1*).—Following the discovery by a commercial grower of the Coates prune, a large-fruited sport of Agen, individual tree records were taken by the U.S. Department of Agriculture in an orchard at Banning, Calif. Among variations discovered were an unproductive and a late-ripening limb, the progeny of which when propagated on Myrobalan roots behaved as did their parents. Several other variations of Agen prune were observed by the authors in various orchards, indicating the importance of taking bud wood from parent trees whose performance is known.

Some characteristics of pigeon chromosomes, R. T. Hance (*Penn. Acad. Sci. Proc., 6 (1932–33), pp. 134, 135, fig. 1*).—In most of the chromosome counts in pigeons the number was seldom over 50 unless fragmentation of the chromosomes was apparent, in contrast with 62 reported by Oguma (E.S.R., 58, p. 218). Two large chromosomes in the male and one in the female were thought to be the sex chromosomes.

Maturation phenomena in the mouse, P. R. Cutright (*Penn. Acad. Sci. Proc., 6 (1932–33), pp. 154–156*).—Chromosome behavior in various stages of reduction division in the male mouse is described.

The effect of sex on the frequency of chiasma formation and its relation to crossing-over in the Wistar rat, W. Bryden (*Cytologia, 4 (1933), No. 3, pp. 241–247, figs. 4*).—A study at the University of Edinburgh of the frequencies of the chiasmata observed between bivalent chromosomes in the germ cells of male and female rats of the Wistar strain is reported. The mean number was higher in females than in males in both the diplotene and metaphase stages.

The morphological similarity of cattle twins in comparison with full and half sisters [trans. title], D. Kisslowsky [Kislovsky] (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 26 (1933), No. 2, pp. 225–235, figs. 6*).—A comparison was made, by means of body measurements, of 19 pairs of twins from records in volumes 43, 44, and 45 of the Black and White Dutch Cattle Herd Book, with 104 full sisters and 133 half sisters with the same dam and 122 half sisters with the same sire.

The correlations between the indexes were not significantly different for the twins as compared with the full sisters, although the slight difference indicated a greater similarity between twins. The correlations were higher between twins than between half sisters by a common dam or sire.

Akhissar spotting of the house mouse, C. E. Keeler (*Natl. Acad. Sci. Proc., 19 (1933), No. 5, pp. 477–481, figs. 2*).—The mating of a male mouse, having a small belly spot, and captured in Akhisar, Turkey, with a nonspotted female produced 9 young, of which 7 were self-color and 2 were self-color with white on the tip of the tail. Inter se matings produced 8 selfs, 2 with white-tipped tails and white belly spot, and 1 with blaze-face, ventral spot, white feet, and white-tipped tail. Selections of high-grade piebalds produced by random matings of these animals gave only high-grade spotted young. Crosses of selfs and piebalds produced young largely self-colored or with white-tipped tail or toes. The F_2 population produced by the self × spotted cross covered the entire series from self to extreme spotting. There were 44 in the classes of self with white feet or tail to 16 in the classes with the extension belly spotting. It thus appeared that the Akhisar spotting was due to a single gene recessive to self, but that the heterozygote may have a white-tipped tail and white feet.

The linkage relations between the Akhisar spotting gene and hairless, which is linked with recessive piebald, were tested to determine if the two spotting genes were synonymous. The F_1s of the Akhisar spotted × hairless cross were normal-haired and self-colored with a few having white-tipped tails. The F_2 population indicated linkage of these genes instead of the 9:3:3:1 ratio expected for independent characters. There were 49 unspotted normal-haired.

32 unspotted hairless, 33 spotted normal-haired, and 1 spotted hairless. The linkage was 14.8±6.1 percent. The genes for recessive piebald and Akhisar spotting are considered to be at the same locus in the chromosome and thus allelomorphic.

On the tricolors in cattle and their inheritance [trans. title], E. Lauprecht (*Jour. Landw., 81 (1933), No. 1, pp. 1–10, figs. 6*).—There are two different kinds of tricoloring in cattle, i.e., black spots on animals of red and white breeding and red spots on animals of black and white breeding. Several examples of these types of tricoloring are described. They illustrate the fact that red spotting in black and white cattle is hereditary, and a multiple allelomorphic series is suggested to explain it. Black spotting in red animals is not hereditary.

Polydactyly and cleft palate in German Edelschwein [trans. title], A. Schotterer (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 26 (1933), No. 2, pp. 219–223*).—The author describes six pigs having an increase in the number of toes on one or both fore feet, three of them also having a cleft palate.

Investigation on the sex life and transmission of domestic animals.—II, The influence of time of service and the heat period of swine on the fertility and sex ratio of the offspring [trans. title], H. F. Krallinger and A. Schott (*Wiss. Arch. Landw., Abt. B, Arch. Tierernähr. u. Tierzucht., 9 (1933), No. 1, pp. 41–49*).—Continuing these studies (E.S.R., 65, p. 526), 46 sows were bred when first in heat and 348 were bred at later intervals. For the early-bred sows the number of pigs per litter averaged 9.8 as compared with 10.5 for the late-bred sows. The percentage of litters per service and the sex of the offspring were not related to the time of service.

Effect of castration on hypophysis cerebri of the male albino rat, S. I. Stein (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 6, pp. 745, 746*).—Castration of 43 albino rats at different ages was found to result in an increase in the size of the pars anterior of the hypophysis, but there was no change in the weight of the posterior and intermediate portions. Allowing the epididymis to remain intact did not influence the result. Large, vacuolated, basophilic cells (typical castration cells) were found in the hypophysis of the test animals.

Partial sex reversal in the fowl, F. D. Reed and C. L. Martin (*Poultry Sci., 12 (1933), No. 2, p. 90, fig. 1*).—In this article from the New Hampshire Experiment Station the authors describe a case of partial sex reversal in a Rhode Island Red fowl.

Effect of hypophysectomy upon pregnancy and lactation, H. Selye, J. B. Collip, and D. L. Thomson (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 589, 590*).—Hypophysectomy in pregnant rats between the tenth and fourteenth days of gestation resulted in resorption of the fetuses, but with later hypophysectomy pregnancy proceeded until term and the litters were born alive. Normal milk secretion followed parturition but stopped after a few hours.

Uterine motility in hypophysectomized and in pregnant rabbits, S. R. M. Reynolds and W. M. Firor (*Amer. Jour. Physiol., 104 (1933), No. 2, pp. 331–339, fig. 1*).—Hypophysectomy in the female was found to prevent the control of uterine activity by the corpora lutea.

The two main types of anterior pituitary gland present in different species of animals, L. Loeb and H. Friedman (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 6, pp. 741–744*).—The effects of extracts of the anterior pituitary glands from different animals on the sex organs and thyroid glands of the guinea pig are compared. On the basis of the biological action of these glands the animals formed two classes, one including cattle, sheep, and swine, and the other rabbit, cat, rat, and guinea pig hypophyses. The results showed that the pituitaries of the species in the second group permitted the follicles to grow to full size and bring about maturation of the granulosa in contrast with the results obtained with the pituitaries from animals in the first group.

Gonadotropic activity of the pituitaries of horses, A. A. Hellbaum (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 641, 642*).—Studies of the action of dessicated pituitaries from sheep and horses injected into 21- to 22-day-old rats showed that the horse pituitaries were at least four times as potent in stimulating ovarian development as sheep pituitaries. The horse pituitaries, particularly those of geldings, stimulated follicle development principally, whereas those of sheep mainly caused luteinization of the ovaries.

Weight of pituitary and thyroid of the rat at various stages of the oestrus cycle, D. H. Andersen (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 657–659*).—The weights of the pituitaries and thyroids of rats killed at various stages of the oestrus cycle showed an increase in the weight of the pituitaries during oestrum with a gradual and progressive decrease during dioestrum. The thyroids showed no significant changes in weight.

Differences in response of female Macacus monkey to extracts of anterior pituitary and of human pregnancy urine, E. T. Engle (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 4, pp. 530–532*).—The ovaries of 31 experimental monkeys treated with anterior pituitary implants, the water soluble fraction of pyridine extract of sheep anterior pituitary, an extract of pregnancy urine, and Antuitrin S (also a pregnancy urine derivative) for from 4 to 30 days were studied.

The results showed complete absence of response after treatment with the derivatives of pregnancy urine regardless of total dosage, length of treatment, method of injection, or age and condition of the animal. The ovaries of animals treated with gland extract were increased in volume and weight, but no changes were apparent in the animals treated with the urine preparations. These data substantiate the idea that extracts of anterior pituitary differ biologically from human pregnancy urine.

Production of exclusively thecal luteinization and continuous oestrus with anterior-pituitary-like hormone, H. Selye and J. B. Collip (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 647–649, figs. 2*).—Rats in the first few days of life and hypophysectomized rats when treated with anterior-pituitary-like hormone were found to respond similarly in that luteinization of the thecal cells of the follicles was induced without maturation. It is assumed that the luteinized thecal cells must be responsible for the continuous oestrum which followed.

Replacement of gonadotropic action of pituitary in the hypophysectomized rat, J. B. Collip, H. Selye, D. L. Thomson, and J. E. Williamson (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 665–667, fig. 1*).—Continuing the above studies, it was found that the administration of an extract of the anterior lobe of the pituitary enabled young rats and restored power to hypophysectomized rats to mature follicles and form corpora lutea.

The necessity of some pituitary factor in the presence of the anterior-pituitary-like hormone to bring about ovarian maturation seems demonstrated.

Further studies on production of thecal luteinization by means of A.P.L., H. Selye, J. B. Collip, and D. L. Thomson (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 6, pp. 780–783, fig. 1*).—Daily injections of from 6 to 25 rat units of the anterior-pituitary-like hormone into young rats, beginning at six days of age, showed that the thecal corpora lutea were conspicuous at the time of the first appearance of oestrum. Continued treatment of these animals resulted in severe follicular atresia. After treatment for from 30 to

40 days irregular cycles appeared and mature follicles and corpora lutea were present in the ovary. It is suggested that the immature pituitary is unable to furnish the complementary substance necessary for the normal action of the anterior-pituitary-like hormone on the ovary, but that it becomes able to do so before normal puberty is reached. Immature virgin guinea pigs were similarly treated with a like result.

These findings support the contention that species differences in the reaction to the anterior-pituitary-like hormone may be due to differences in the ability of the pituitary to furnish the complementary substance necessary for the normal reaction on the ovary.

Recent progress in the chemistry of the oestrus-producing hormones, G. F. MARRIAN (*Sci. Prog. [London], 28 (1933), No. 109, pp. 69–78*).—A summary of investigations of the chemistry of the oestrum-producing hormones and synthetic oestrum-producing compounds.

A lactation hormone of the adrenal cortex, K. A. BROWNELL, J. E. LOCKWOOD, and F. A. HARTMAN (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 6, pp. 783, 784*).—Cortical extract made with the removal of fat at —12° C. did not permit lactation in adrenalectomized rats, although it was potent as far as the cortin content was concerned. When the removal of fat from the extract was made between 3° and —12° C., adrenalectomized mother rats were enabled to raise a larger portion of their young.

The function, assay, and preparation of galactin, a lactation stimulating hormone of the anterior pituitary, and an investigation of the factors responsible for the control of normal lactation, W. U. GARDNER and C. W. TURNER (*Missouri Sta. Res. Bul. 196 (1933), pp. 61, figs. 31*).—After reviewing the results of the influence of ovarian and pituitary hormones on mammary gland development in various animals, the results of studies of the effect of galactin (the lactation-stimulating hormone of the pituitary) on the initiation or stimulation of lactation in various animals are reported.

The results showed that lactation was initiated or stimulated in the rabbit, guinea pig, bitch, and sow, but the rat, mouse, and monkey did not respond in the same way. The lack of response to galactin in the glands of immature male and female rabbits, and the involuted mammary gland, suggests the operation of some other substance in conditioning the gland, which seemed to be ovarian in nature. Immature glands, stimulated by theelin or corporin, responded to galactin, as did the glands of ovariectomized rabbits simultaneously injected with theelin.

Galactin was obtained from both cattle and sheep and was found to be soluble in dilute acids and alkalis, but was insoluble in slightly acid to neutral solutions. Other properties of galactin, including its stability in solution and destruction by heat, are described. They indicate that galactin is distinct from the growth-promoting and gonad-stimulating hormones of the pituitary.

A method of assay is suggested, based on seven daily injections in rabbits pseudopregnant from 12 to 16 days.

The mechanism controlling normal lactation and the intermediate relation between the pituitary and ovarian hormones in this function are discussed at some length.

The normal development of the mammary gland of the male and female guinea pig, C. W. TURNER and E. T. GOMEZ (*Missouri Sta. Res. Bul. 194 (1933), pp. 32, figs. 40*).—The developmental anatomy of the mammary gland from embryonic stages through lactation in the guinea pig is described, as in the rat, previously noted (E.S.R., 69, p. 349).

Action of theelin on the domestic fowl, J. B. Mitchell, jr. (*Soc. Expt. Biol. and Med. Proc.*, *30* (*1933*), *No. 4*, *pp. 500, 501*).—Injections of an olive oil solution of theelin in doses as low as 20 rat units per day caused new growing feathers on males to be of the female type. Saline solutions of theelin were without effect on the feather character, possibly because of the too rapid absorption and elimination of the saline solution. Prolonged injection of the oil solution caused no change in the head furnishings, but autopsy revealed a decided stimulation of the oviducts.

FIELD CROPS

The analysis of replicated experiments when the field results are incomplete, F. Yates (*Empire Jour. Expt. Agr.*, *1* (*1933*), *No. 2*, *pp. 129–142*).—Procedure introduced by Allan and Wishart (E.S.R., 65, p. 221) for supplying a missing value in a table of experimental results, as the plat yields of a field trial, so that the treatment means form unbiased and efficient estimates of the treatment effects, is extended to enable any number of missing values to be replaced. The solution of a complex example is effected by iterative methods. Investigation of the validity of analysis of variance on the completed table of values showed that when the degrees of freedom allotted to error are reduced by the number of values replaced, little disturbance occurs, provided the number of missing values is not too great. The standard errors of the treatment means are also briefly discussed. The use of the missing-plat technic for further analyzing interactions whose significance is believed due to a few anomalous values is illustrated by the analysis of a set of varietal trials with cotton.

Crop yields over nineteen years from Highmore Experiment Farm, A. N. Hume (*South Dakota Sta. Bul. 272* (*1932*), *pp. 67, pl. 1, figs. 5*).—Consideration of the yields of corn, winter and spring wheat, oats, barley, flax, emmer, and rye obtained in definite crop sequences or rotations on the Highmore Substation within the period 1912–32 showed that the most effective sequence from the viewpoint of profitable crop production comprised a cultivated crop, a small grain, and a legume. Maximum yields of all grains were produced on land cultivated in the previous season, i.e., a cultivated crop, or in the case of barley or oats, on fallow. Their comparatively high money returns and the wide range of succession which they severally furnish after any cultivated crop indicate one of the small grains as one element in an efficient cropping system. However, only one grain crop in any succession probably should be used in a rotation, partly because of the reduced small grain yields obtained from land in continuous small grain. A legume crop is indicated as a third element of a most efficient sequence, for the highest corn yield was made in such rotations, and yields of small grains were increased in rotations including legumes, plowed under for green manure, or harvested for hay or seed or both. The average gross money return from corn and other cereals was higher where a legume plowed under for green manure was part of a rotation than where it was omitted.

The plan indicated for crop sequences might apparently be modified without loss of efficiency so long as the general order of the kind of crops in the sequence is preserved; for example, the highest money return from a rotation came from the sequence corn, barley plus sweetclover, potatoes, barley (alfalfa), which kept the order although extending the period covered. The order of sequence seemed more important from the viewpoint of efficiency than the kind of crop. Thus winter wheat did comparatively well directly after corn, but not better than after millet in cultivated rows. Barley yielded well following corn, but even better after potatoes, a cultivated crop.

Survey of the forage crop seed situation in the prairie provinces of Canada, G. M. STEWART (*Sci. Agr., 13 (1933), No. 11, pp. 687–697, fig. 1*).—Available information on Canadian imports and exports of forage crop seeds is assembled, with discussion of seed production in the prairie provinces and the areas and extent of present production.

The use of winter legumes in the Southeastern States, A. D. McNAIR and R. McKEE (*U.S.Dept.Agr., Tech. Bul. 367 (1933), pp. 36, figs. 9*).—Actual experiences of farmers in North Carolina, South Carolina, Georgia, and Alabama, who grew winter legumes for fertilizing cotton and corn, and the costs of and benefits from the use of winter legumes under actual farming conditions are described from surveys made in 1929–30. The legumes in order of importance were hairy vetch (*Vicia villosa*), Austrian winter peas (*Pisum arvense*), crimson clover (*Trifolium incarnatum*), and southern bur-clover (*Medicago arabica*).

The increased yield of corn after winter legumes averaged 14.1 bu. per acre, and of cotton 100 lb. of lint per acre, and the net profit from the use of winter legumes for corn ranged from $3.99 to $9.19 per acre, and for cotton from $2.24 to $9.69, according to low and high prices. The increased yield of corn and of cotton after winter legumes was slightly greater south of latitude 33° than north of that line.

Observations are also recorded on the residual and grazing values of winter legumes, soil preparation, planting practices, inoculation, the percentage of crop land in winter legumes, the merits of home-grown seed, and the places of these legumes in the crop rotation and their adaptation to share crop conditions.

Grain as food and as seed [trans. title], G. TALLARICO (*Mem. R. Accad. Ital., 3 (1931), Biol., No. 1, pp. 329, figs. 2; Eng. abs. in Chem. Abs., 27 (1933), No. 4, pp. 757, 758*).—This is an extensive compilation based on 450 titles as appended, supplemented by investigations and meteorological data from various localities in Italy.

When fed to young turkeys small-sized seeds of cereals were better digested and resulted in larger gains in weight than large seeds. Hens fed whole-wheat flour laid more fertile eggs than hens fed white flour, and the chicks from such eggs were larger and healthier. Young turkeys made better growth on malted than on unmalted barley.

Fed on grains grown on fields fertilized with stable manure or chemical fertilizers, young turkeys fed on grains from the manured fields came through the critical period of growth with fewer deaths and with greater vitality. The question is raised whether animal fertilizers may not show specific effects not exerted by artificials. Even when the yield per hectare was the same, grains produced on land following a leguminous crop had a higher nutritive value than grains from fallowed ground, and these in turn were qualitatively better than grains from soil fertilized with chemicals.

It is concluded that seeds grown under arid conditions have a greater germinating power and more vitality than seeds grown under humid conditions. Seeds from plants that are overnourished during the growing period have less vitality than seeds from poor soil. Seeds from late plantings (resulting in a shorter growing period) have more vitality than seeds from early plantings. Seeds stored in well-ventilated containers lose vitality more rapidly than seeds stored with restricted aeration. Certain grains gain in vitality when held for definite times at certain low temperatures. Soaking seeds in water and solutions of certain salts and acids increases the vitality of the seeds, especially when planted in poor soil.

Grassland management and its influence on the sward.—Part II, The management of a clovery sward and its effects, M. G. Jones (*Empire Jour. Expt. Agr., 1 (1933), No. 2, pp. 122–128, pl. 1*).—The present paper deals with the practical application of the results described earlier (E.S.R., 69, p. 792) and their influence on the botanical composition of a recently established turf when subjected to four methods of grazing, which differed only in regard to the time of grazing and the intensity of stocking. Each method was used on a plat receiving both phosphatic and nitrogenous fertilizer and compared with a corresponding plat receiving phosphate only.

Although the nitrogenous dressing approximately doubled the actual yield of fodder during the early period of grazing, it had relatively little influence on the botanical composition of the turf. On the other hand, the time and intensity of grazing markedly affected the botanical composition in relation both to the proportion of grasses to clovers and to the inroad of weed grasses and thistles, thus governing the improvement or deterioration of the turf.

The soils and crop production in Genesee County, New York.—II, Pastures, D. B. Johnstone-Wallace (*New York Cornell Sta. Bul. 567 (1933), pp. 32–55, figs. 13*).—The types of pastures and their botanical composition and pasture plants in Genesee County, N.Y., are described, and methods are suggested for pasture improvement by fertilization and management without plowing and by plowing and re-seeding.

Better methods for growing alfalfa, W. C. Etheridge and C. A. Helm (*Missouri Sta. Bul. 326 (1933), pp. 16, fig. 1*).—Improved cultural methods and field practices are recommended for alfalfa production in Missouri, particular attention being given to selection of the soil, seed bed preparation, seed, cultivation of the established stand, and diseases. Experiments on various production problems are also reviewed.

Comparative tests showed the highest grades of commercial seed of common to outyield the best of lower grades by 1,500 lb. of hay per acre per season, and the lowest grades by over 3,000 lb. Foreign alfalfas were inferior to domestic strains. On very fertile land, e.g., on Marshall, Summit, Boone, and Shelby silt loams, common alfalfas surpassed or equaled Grimm through the life of 3-year stands. On land of medium productivity for alfalfa, Grimm usually outyielded common.

Harrowing the stubble with a spring-tooth harrow just after removing the cured hay maintained a clear vigorous growth of alfalfa, while on uncultivated areas the growth was about half alfalfa and half weeds, although yields did not differ much. Around August 15 appeared to be a good time for planting the late summer crop, and in March for spring seeding.

Effects of inoculation and liming on alfalfa grown on the Grundy silt loam, R. H. Walker and P. E. Brown (*Iowa Sta. Bul. 305 (1933), pp. 41–69, figs. 16*).—In experiments made on Grundy silt loam to determine the effects of lime and inoculation, separate and in combination with manure and superphosphate, on the yield and quality of alfalfa produced, quarry-run limestone in varying quantities, limestone of different degrees of fineness, and hydrated lime were applied to different plats, and inoculated seed was used on one half of each plat and untreated seed on the other half. See also an earlier note (E.S.R., 69, p. 515) for similar studies with soybeans.

No alfalfa was produced on the plats with either lime or inoculation alone or with both omitted. On limed plats sown with inoculated seed alfalfa was produced, the stand and hence the hay yield being determined by the kind and quantity of lime applied and, to some extent, by manure and phosphate. Quarry-run limestone up to 3 tons per acre, the lime requirement of the soil, increased greatly the total yield of dry matter produced, and while 4, 5, and 6 tons per acre produced a significant increase in the dry matter yield over the 3-ton treatment, the yields produced by the 4-, 5-, and 6-ton applications, respectively, did not differ to a significant extent. Manure in addition to the various lime treatments increased the yield significantly, but superphosphate applied in addition to manure and lime did not increase the yield significantly on all plats. Finely screened limestone increased the yield over quarry-run and hydrated lime in treatments made at the same rate, but there was no significant difference in the effects of different grades of screened limestone.

The percentage of nitrogen in the alfalfa was increased materially by inoculation, the largest increases occurring on the plats where enough limestone to correct the acidity of the soil had been applied. The greater crop yield and higher nitrogen content combined to increase the total amount of protein produced per acre in the crop as a result of inoculation and liming. The percentage of calcium in the crop was increased materially by the two treatments, especially by the lime. The percentage content of calcium in the crop was directly related to the quantity of limestone applied and to the degree of the fineness of the limestone. Besides the increase in yield of alfalfa due to liming and inoculation, the improvement in quality is emphasized.

General recommendations for liming and inoculation are made to aid in the growing of alfalfa on Grundy silt loam or on other soils which are acid in reaction and deficient in the proper root-nodule bacteria.

The commercial utilization of Spartan barley, H. C. RATHER (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 23–25, fig. 1*).—Spartan barley is reported as giving favorable results in the malting and pearling industries.

Influence of various nitrogenous compounds and mannitol on nodule formation by clover, E. W. HOPKINS and E. B. FRED (*Plant Physiol., 8 (1933), No. 1, pp. 141–155, figs. 2*).—Red clover plants grown in bottles having a substrate of a nutrient solution containing agar received 2, 5, 10, and 20 mg of nitrogenous substances, including potassium nitrate, ammonium sulfate, urea, asparagin, clover seed extract, and yeast extract, with and without addition of 0.5 percent mannitol.

The effect of the nitrogen compounds upon the number of nodules varied considerably, and the results were not entirely consistent with increasing concentration of the nitrogen compounds. All of the nitrogen sources used decreased the size of the nodules formed, and this was more evident as the concentration of the nitrogen compound was increased. The nitrogen compounds also affected the distribution of the nodules. In the untreated control, the nodules were situated largely on or near the tap root; a few large or long nodules were present with most of them of a fair size but round. In the presence of the nitrogen compounds the nodules were principally on the secondary roots and were nearly all round and small, a condition attributed to later invasion of the roots by the organism, owing to the presence of the nitrogen compounds. In the series containing both nitrogen and mannitol the nitrogen source no longer affected the distribution of nodules, which were principally on the tap roots. Increasing concentrations of the nitrogen compounds decreased the size of the nodules formed.

Fertilizers and manure for corn, C. A. MOOERS (*Tennessee Sta. Bul. 149 (1933), pp. 15*).—Field experiments for various periods and on different soil types in Tennessee showed that about 200 lb. of superphosphate per acre sufficed for corn on the soils of the Cumberland Plateau and the Highland Rim, which are very poor in phosphorus, and from 100 to 150 lb. on soils medium poor in phosphorus. On a number of the poor soils of the State, corn made no response to potash. On a gray soil at Jackson, yields of cotton and cowpeas were increased markedly, whereas corn and oats did not respond to potash. Trials of different nitrogen carriers for corn at Jackson favored sodium nitrate and ammonium sulfate over organics both in gains and yield and in cheaper cost. Yields slightly favored sodium nitrate, although ammonium sulfate has been much cheaper in recent years. Early application of sodium nitrate, i.e., from when the plants are coming up until knee high, was indicated from tests in several localities. Ammonium sulfate may be applied when the plants emerge from the soil. Corn responded far better to manure on poor land in Knox County and at Jackson than on the rich land at the station.

Field propagation of cotton by means of grafts, H. E. Rea (*Plant Physiol., 8 (1933), No. 1, p. 171*).—The high percentage of successful grafts obtained by the Texas Experiment Station with field grafts of Lone Star cotton made from 1 to 10 p.m. and from 4 to 11 a.m. on September 18 to 22, inclusive, with a temperature range of from 68° to 93° F., showed that cotton can be grafted successfully under a wide range of field temperatures.

Effects of plant spacing and irrigation on number of locks in cotton bolls, A. R. Leding and L. R. Lytton (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 1, pp. 33–52, figs. 4*).—In spacing experiments made at State College, N.Mex., by the U.S. Department of Agriculture with Acala cotton, a variety normally producing from 75 to 85 percent of 5-lock bolls, close spacing of the plants tended materially to increase the proportion of 4-lock bolls. In general, the percentage of 4-lock bolls rose or fell as the number of plants in the rows was greater or less. Differences in irrigation treatment also affected the proportion of 4-lock and 5-lock bolls. On plants grown under light irrigation as compared with normal irrigation, percentages of 4-lock bolls were increased, although the effects of irrigation were not so great as those of spacing.

Cotton in tropical Africa, P. E. A. Janssens (*Le Coton en Afrique tropicale. Bruxelles: R. Bausart, 1932, pp.* [*3*]+*402*+[*4*], *pls.* [*34*], *figs.* [*37*]).—The botanical relationships and characters of cotton are summarized, and information is given on the climatic conditions, soils, culture, improvement, harvesting, and marketing practices; diseases; and insect pests involved in cotton production in tropical Africa. The characteristics and status of the industry in the several British, Belgian, French, Italian, and Portuguese colonies and mandates in Africa are considered in some detail. A bibliography is appended.

Oat variety tests, J. E. Metzger (*Maryland Sta. Bul. 347 (1933), pp. 517–524*).—Trials of oats varieties made during two years in 6 counties on 22 farms, largely dairy farms, showed that early-maturing, medium-sized seed of known adaptability is best for all parts of Maryland, and is also preferred for hay purposes. The Iowar, Cornellian, and Richland varieties appeared most suitable for the western counties; these varieties and Fulghum for northern and central Maryland; and either Culbertson, a winter variety, or Fulghum in southern Maryland. Fertilizer tests indicated that an ample supply of phosphorus with a wide ratio between the available nitrogen and phosphorus content of the soil reduces lodging and affects favorably the quality and maturity of the crop. In sections of the State where winter barley may be grown it should be given preference over spring oats.

Tests of varieties and strains of large-seeded Virginia-type peanuts, J. H. Beattie and E. T. Batten (*U.S. Dept. Agr. Circ. 272 (1933), pp. 4*).—Comparative tests during three years in cooperation with the Virginia Experiment Station suggested that at least 7 strains of Virginia-type peanuts, 5 from commercial sources and 2 from selection work by the station and the U.S.D.A., Bureau of Plant Industry, have inherent qualities of extra-large seed. The advantages of general use of these strains are indicated.

Study of rice fertilization, L. C. Kapp (*Arkansas Sta. Bul. 291 (1933), pp. 37*).—Field and greenhouse studies were made to determine why phosphate fertilizers did not return profitable rice yields. The available phosphorus of the soil and the phosphorus content of the rice plants were analyzed after they were grown in differently treated soils.

Phosphorus added to Clarksville and Crowley silt loam in the greenhouse did not always increase rice yields and did not increase field yields. Even though the soil solution contained very little available phosphorus, additions of phosphorus did not greatly increase rice yields, nor was more phosphorus detected in the soil solution. Large additions of slaked lime, 5 tons per acre in 2 years, did not decrease the phosphorus content or growth of plants compared with untreated plats. As the plants increased in growth and yields, as results of different nutrient applications, their phosphorus content decreased, indicating that they obtained from the soil all the phosphorus needed for maximum growth. The phosphorus content of rice plants decreased as the plants aged, although application of 500 lb. of monocalcium phosphate per acre increased the phosphorus content of greenhouse plants at 57- and 88-day growth periods without affecting yield. Increased yields from dried and sterilized soil compared with moist soil were not correlated with the phosphorus in the soil solution, which was similar in each case. The calcium and phosphorus percentages in the plants were not closely related.

Addition of ammonium sulfate and sodium nitrate to soils, followed by submergence, resulted in a loss from practically all nitrogen carriers in 16 days, the nitrates being lost more rapidly than ammonia. Nitrites evidently were not accumulated in submerged soils enough to prove toxic to rice seedlings. When soils treated with ammonium sulfate and sodium nitrate were evacuated for 3 weeks, the nitrogen from the carriers was not lost as ammonia. Liming decreased total nitrogen content of the soil and increased that of the plants.

Large biweekly applications of sodium nitrate and ammonium sulfate on Clarksville soil greatly increased yields of rice planted May 12. The nearly constant number of sterile glumes for each treatment indicated that high nitrogen additions did not prevent grain formation in formed glumes. The sodium nitrate in the highest frequent applications surpassed the ammonium sulfate in grain production. Heavy applications of phosphate and potash failed to increase yields to any extent.

Nitrogen applied to rice planted July 23 on Crowley soil usually increased straw and grain yields, but also increased the weights of sterile glumes. Phosphate and potash fertilization increased the straw yield and sterile glumes, but decreased the yield of grain. Rice straw applications decreased the growth and yield of rice, although nitrogen applied to straw-treated soil increased the yields.

Accumulation of ammonia by ammonification in virgin and dried cropped soil was greater than in moist cropped soil. Rice straw and roots and starch reduced the accumulation of ammonia in untreated soils and also reduced the increase due to ammonification of albumen. The nitrogen from soils treated with sodium nitrate did not appear to be lost as ammonia, as little ammonia was produced.

In general, lack of nitrogen seemed responsible for most of the abnormal growth and low yields of rice. The ammonia content of the soil never did indicate that the rice plants were receiving sufficient available nitrogen except where large quantities of nitrogenous or liming materials were added.

Balbo rye, C. A. Mooers (*Tennessee Sta. Circ. 45 (1933), pp. 2*).—Balbo rye, characterized by a rapid upright growth habit resembling Abruzzi rye, outyielded Rosen, native, and western rye in grain production over 3 years and proved of value for fall pasturage.

Sudan grass as an emergency pasture on light soil, A. B. Dorrance (*Michigan Sta. Spec. Bul. 240 (1933), pp. 11, figs. 2*).—Sudan grass was compared since 1929 with several other emergency pasture crops near Augusta, Mich., on Bellefontaine sandy loam, a naturally acid and poor, droughty soil. Sudan grass proved far more productive than Dwarf Essex rape (of excellent quality), averaging 200 more sheep-grazing days per acre per season. The grass was available earlier, more abundantly, and longer than alfalfa and sweetclover seedings, and sowing these legumes in Sudan grass to be pastured was tried without success. A spring oats-winter rye mixture furnished pasture in June and July and none thereafter. Corn drilled solid was much less satisfactory than Sudan grass as a summer pasture. While a Sudan grass-soybean mixture had some advantages over pure Sudan grass in total grazing and gains by the lambs, the increase was not significant and the extra expense hardly warranted. Cultural and grazing suggestions are included.

Some effects of inbreeding in sugar beets, G. Stewart (*Jour. Amer. Soc. Agron., 25 (1933), No. 4, pp. 237–258, figs. 4; abs. in Utah Sta. Circ. 102 (1933), p. 10*).—Breeding work with sugar beets, carried on by the station working with the U.S. Department of Agriculture and other agencies, was aimed to obtain superior agronomic strains and to isolate inbred lines for hybridization studies in an effort to combine high yield and high sugar content with resistance to disease, especially curly top. Detailed studies of the variability of length and widths of leaves and petioles on 59 strains derived from 300 roots of Janascz beets chosen in 1925 showed a number of strains to be more uniform than the parent variety in these characters. A sugar test in 1 year showed a trend toward uniformity in sugar percentage. Some strains lost vigor under inbreeding, while most others lost little or none. Strains differed markedly in shape, outline, and crinkling of leaf and in seed stalk characters; and chlorophyll deficiencies, fasciation, and other abnormalities appeared.

Winter wheat varieties in Nebraska, T. A. Kiesselbach, A. Anderson, and C. A. Suneson (*Nebraska Sta. Bul. 283 (1933), pp. 24, figs. 5*).—Comparative trials of varieties of winter wheat for yield and other agronomic characters and for quality are summarized for the period 1924–32, improvement work with the crop by the station is reviewed, and varieties commercially important or of special interest are described briefly. See also an earlier note (E.S.R., 55, p. 135). The work has been in cooperation with the U.S. Department of Agriculture since 1930.

Winter wheat, second only to corn as a crop in the State, averaged 54 million bu. on approximately 3⅛ million acres during the past five years, whereas spring wheat was confined to about 5 percent of the total acreage. Estimates were that fully 99 percent of the current winter wheat acreage in Nebraska was of the hard red Turkey type; 1 percent or less of soft red varieties; 65 percent of the hard red winter wheat acreage consisted of Nebraska No. 60; 15 percent of Kanred; and 20 percent of ordinary Turkey under several names and a number of obscure selections.

Nebraska No. 60, as distributed in 1918, has yielded 2 bu. or 6 percent more per acre than the original Turkey in 20 years of station tests, and is characterized by superior winterhardiness and good quality of grain. Cheyenne, the most recently distributed variety and selected from Crimean, in the station nurseries surpassed the original by 14 percent in a 5-year field plat test, and by 21 percent in the preceding 5-year nursery test. During the last 5 years

Cheyenne surpassed 65 other varieties tested in yield, and also is characterized by strength of straw, resistance to shattering, and tolerance to Hessian fly, and is satisfactory in cold endurance and milling quality. The more recent nursery program resulted in the isolation of lines resistant to both bunt and Hessian fly and apparently desirable otherwise.

Winter wheat production in South Dakota, K. H. W. Klages (*South Dakota Sta. Bul. 276* (*1933*), *pp. 31, figs. 8*).—Cultural, variety, nursery, and rotation experiments with winter wheat, carried on as heretofore (E.S.R., 49, p. 635) at the station and certain substations, are reviewed with discussion of the adaptation and distribution of the crop in South Dakota, and its place in the cropping program.

The acreage of winter wheat in South Dakota increased materially during the last three years, and winter wheat in 1931 comprised 7 percent and in 1932 9.1 percent of the total wheat produced in the State. Not all parts of South Dakota are adapted to winter wheat production, but in sections with conditions too severe for winter wheat, winter rye may be grown to advantage.

Winter wheat is considered relatively safe in the east-central and southern portions of South Dakota, but its culture is hazardous in the central and northern parts of the State as is indicated by experiments at Highmore and Eureka. During 23 years, winter wheat at Brookings averaged 25.2 bu. compared with 17 bu. for durum and 15.6 bu. for hard red spring wheat.

Effects of the preceeding crops on the yield of winter wheat depend primarily on the protection afforded during winter by the remains of such crops. Winter wheat on fallow or on bare land yielded materially less than where protected by cornstalks or the stubble of small grains. Sown in standing corn at Brookings, winter wheat yielded 21.5 bu. v. 13.1 bu. where grown without the protection of cornstalks. At Eureka, winter wheat on fallow yielded 3.2 bu. v. 13.2 bu. after drilled corn. Winter wheat following millet in rows at Highmore yielded 13.7 bu. v. 8.8 bu. after fallow. The use of straw mulches neither reduced the number of crop failures nor increased the yields of winter wheat.

Planting tests suggested that for maximum yields winter wheat should be sown from September 1 to 7. Indeed, material decreases may be expected when seeding is delayed beyond September 15. A rate of 5 pk. per acre was indicated for eastern South Dakota and a 4-pk. rate in the central and western sections.

Yield and spring survival data from regular variety tests and nursery plats at Brookings and Highmore showed Minturki, Kharkof, and Turkey S.D. 144 to be the leading varieties. Kanred also returned good yields but suffered more from winter-killing than these varieties. Turkey S.D. 144 was the highest yielder at Eureka.

Saving wheat from winter injury, C. A. Lamb (*Ohio Sta. Bimo. Bul. 164* (*1933*), *pp. 122, 123*).—Suggested ways to reduce the loss caused by winter injury to winter wheat include improved cultural practices, as early seed bed preparation, liberal fertilization, planting as early as possible after the date set for avoiding Hessian fly, and better drainage, and the development of a more winter-resistant variety.

Soil inoculant service, H. J. Conn and A. W. Hofer (*New York State Sta. Circ. 137* (*1933*), *pp. 4, fig. 1*).—The soil inoculant service of the station, described briefly, includes the testing of cultures of bacteria for inoculation of legume seed, study of testing methods, cooperation with manufacturers desiring better methods of producing reliable cultures, and informing farmers on the merits of various brands of inoculants on sale in New York.

Some recently noticed mustards, H. Groh (*Sci. Agr., 13* (*1933*), *No. 11, pp. 722–727, fig. 1*).—Among weeds newly recorded in Canada were dog mustard

(*Erucastrum gallicum*), tall hedge mustard (*Sisymbrium loeselii*), Austrian cress (*Rorippa austriaca*), *Rapistrum perenne*, and *R. rugosum*.

Distribution of leafy spurge (Euphorbia virgata) in the United States, H. C. HANSON (*Science, 78 (1933), No. 2011, p. 35, fig. 1*).—The States in which infestations of leafy spurge appear to be most serious currently are Minnesota, North Dakota, South Dakota, and New York. It seems to have only recently invaded Wisconsin, Iowa, Illinois, Nebraska, Colorado, Montana, Idaho, and Washington.

Weed control in the asparagus planting, R. M. SMOCK (*Ohio Sta. Bimo. Bul. 164 (1933), pp. 124, 125, fig. 1*).—When calcium cyanamide was applied on May 25, broadcast or in bands at different acre rates on an asparagus bed where weeds were from 1 to 2 in. high, almost complete control of annual weeds was obtained throughout the cutting season. There apparently was no difference in effectiveness between the granular and the pulverized forms, but row applications seemed more feasible than broadcasting. No apparent reduction occurred in yield even with the 1,000-lb. applications.

HORTICULTURE

The soils and crop production in Genesee County, New York, III, IV (*New York Cornell Sta. Bul. 567 (1933), pp. 56–82, figs. 7*).—Based on surveys made of 160 farms on 7 soil types, information is presented by F. O. Underwood in part 3, Vegetable Crops (pp. 56–81) on varieties, methods of culture, use of fertilizers, etc., employed in the growing of beans, cabbage, carrots, cucumbers, lettuce, onions, peas, potatoes, sweet corn, and tomatoes. Brief comments by J. Oskamp on the fruit growing situation in the county are included in part 4, Fruit-growing (p. 82).

A chamber for experimentally freezing horticultural products at very low temperatures, H. C. DIEHL (*Science, 78 (1933), No. 2010, pp. 15, 16*).—The construction and operation of a small freezing unit, devised by the U.S. Department of Agriculture, in which temperature could be reduced to —100° F. is described. Solidified carbon dioxide is used as the cooling medium, with denatured alcohol as the medium of heat transfer.

Artificial radiation as a means of forcing greenhouse crops, R. B. WITHROW and M. W. RICHMAN (*Indiana Sta. Bul. 380 (1933), pp. 20, figs. 11*).—Seeking to determine the most effective light intensity and periods for providing additional light, various flowers growing in greenhouse beds or benches were subjected to different light treatments. In general it was evident that light of comparative low intensity exerts a strong influence on flowering and growth. With Heart of France asters a 15-w lamp 4 ft. above the bench and operated for 10 hours each night was nearly as effective as a 500-w lamp which produced approximately 75 times as much visible light. The best quality pansies were produced under low light.

In general, with the species studied light applied during the early stages of the plant's growth was most effective in increasing flower production and hastening flowering. Additional light at later stages often affected stem length but had little influence on flower behavior. The Legion of Honor marigold was an exception, responding to light throughout its life. The time of night that the supplemental light was applied had little significance. In high light intensities 5 hours was nearly as effective as 10 hours, but with low intensities it is believed that longer periods are more desirable.

In studies with 8 varieties of asters the results were sufficiently variable to indicate the need of determining varietal as well as species response.

Shasta daisy, perennial gaillardia, scabiosa, nasturtium, and dahlia were among the plants responding sharply to light changes.

Lettuce production on the muck soils of New York, J. E. Knott (*New York Cornell Sta. Bul. 564 (1933), pp. 27, figs. 7*).—Interpolated with the results of several cooperative fertilizer, variety, and strain tests, a general discussion is presented of cultural methods employed in the production of lettuce on muck soils.

The results of the fertilizer trials indicated that the character of the muck and the length of time that it had been under cultivation had important bearings on the character of the fertilizer required. Potash was found especially important on newly tilled mucks, but where the soil had been cultivated for several years potash had less effect, suggesting an accumulation of a reserve supply. The percentage of phosphorus was not varied in experiments, but its value for lettuce was seen in comparisons with unfertilized plats. Nitrogen was not found essential on newly cleared woody muck but was needed on freshly cleared reed or sedge muck. However, as time progressed the need of nitrogen increased so that for muck under cultivation longer than 10 years from 750 to 1,000 lb. of a 5–10–5 mixture is recommended for early and resow plantings and from 500 to 750 lb. of a 3–12–6 for intermediate plantings. A side application of 100 lb. per acre of nitrate of soda or ammonium sulfate is suggested where rains have flooded the lettuce fields.

As to the effect of fertilizer on weight of heads, in general potash increased the weight on recently cleared muck, with nitrogen more important on mucks cultivated for several years. Tipburn was apparently more severe where large quantities of fertilizer, particularly nitrogen, were used, suggesting the need of avoiding overfertilization.

In a test of 39 strains of lettuce, one stock of White Boston was found outstanding in ability to yield marketable heads with little tipburn. The New York variety failed to give satisfaction.

Some edible and poisonous mushrooms of North Dakota, H. L. Barnett (*North Dakota Sta. Bul. 270 (1933), pp. 32, figs. 34*).—In this profusely illustrated bulletin descriptions are presented of a large number of mushrooms, supplemented with a section on Preparation of Edible Mushrooms, by E. Latzke.

Onion culture, J. W. Lloyd (*Illinois Sta. Circ. 410 (1933), pp. 16*).—A general discussion on the growing of onions from seed, transplants, and sets, with a section on Insects Injurious to Onions condensed from Circular 391 (E.S.R., 67, p. 150).

Progress report on breeding of sweet corn for corn borer resistance, A. R. Marston and C. H. Mahoney (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 472–476; abs. in Michigan Sta. Quart. Bul. 16 (1933), No. 1, p. 46*).—Crosses made at the Michigan Experiment Station between Maize Amargo, a South American flint corn resistant to the corn borer, and various commercial types of sweet corn yielded in the F_4 generation 21 progenies equally as resistant as the South American parent and of the sweet corn type of the Golden Bantam. Some of the progenies had a higher sugar content than inbreds of Golden Bantam but were later in maturing, as measured by their pollination dates. No correlation was recorded between Amargo type and corn borer resistance. Resistant progenies were also obtained in crosses between Maize Amargo and Sunshine and Early Evergreen varieties. Homozygosity for resistance to corn borer was approached but not attained in the F_4 generation of the cross between Golden Bantam and the South American corn.

The suitability of immature sweet corn for seed, J. Walker (*Sci. Agr., 13 (1933), No. 10, pp. 642–645*).—Germination records taken at the Manitoba Agricultural College on Burbank Golden Bantam sweet corn seed taken from ears of the same planting but harvested at different stages of maturity indicated that reasonably good germination and strong plants may be expected from rather immature but fairly well developed sweet corn seed which had been well cured and carefully handled. The germination of samples harvested 31 days from silk to 55 days from silk ranged from 90 to 99 percent in laboratory trials.

The effect of soil moisture on the availability of nitrate, phosphate, and potassium to the tomato plant, E. M. Emmert and F. K. Ball (*Soil Sci., 35 (1933), No. 4, pp. 295–306, figs. 7*).—Using two different types of soil, (1) a brown to black clay loam, and (2) three parts soil to one part of well rotted compost, held at 10, 20, and 40 percent of moisture, it was found in studies at the Kentucky Experiment Station that soil moisture exerted a profound effect on the uptake of nitrogen and phosphorus but not of potassium by tomato plants.

With respect to nitrate concentration in the plant the 20 percent soil produced the highest nitrate accumulation at the start, but the 10 percent moisture soon induced an accumulation which remained abnormally high to the close of the experiment. The lower concentration of nitrate in the plants in 40 percent soil is deemed either due to lessened nitrification or to a more rapid utilization by the plant. The most nitrate remained in the soil containing 10 percent of moisture.

Phosphate concentration in the plant varied directly with the percentage of soil moisture after the initial readily available supply was exhausted. At the end of the experiment it was evident that a lack of water had a decidedly depressing effect on the phosphate concentration in the plants.

Potassium concentration in the plant did not vary greatly from one moisture percentage to another. Green weight of plant was directly proportional to the amount of soil moisture.

Values were generally higher in the more fertile soil but with the same general trends.

Pruning and training tomatoes in Arkansas, V. M. Watts (*Arkansas Sta. Bul. 292 (1933), pp. 15*).—Experiments conducted at Fayetteville and at Hope using, however, different varieties, gave somewhat different results. At Fayetteville total yields were markedly and consistently reduced by pruning in proportion to its severity, while at Hope the results were less consistent. In no case did pruning significantly increase the early yield, and in certain cases it did actually reduce early yield. There appeared to be no significant effect of pruning on the percentage grade of fruits at either location.

Simple training of the vines increased yields at Fayetteville throughout the season, but at Hope marketable yields were not influenced by such treatment. A slight decrease in percentage of culls was observed on trained plants at Fayetteville but not at Hope. Pinching back the leader influenced yield in much the same manner as other types of pruning.

From a practical viewpoint the results of the study apparently indicated that labor spent in heavy pruning of tomatoes is not justified, and that such treatment may actually reduce yields. However, wherever training is profitable light pruning may be beneficial because of its help in tying.

Adjusting orchard practices to present economic conditions, G. F. Potter (*N.Y. State Hort. Soc. Proc., 78 (1933), pp. 210–223, figs. 5*).—Based on studies in 12 New Hampshire orchards, including some 17,000 trees about 20 years of age or younger, it is concluded that certain fundamental operations could be reduced in cost without material impairment of quality or of returns. The orchardist who spent the least time in orchard operations prior to harvest made the largest net profit per bushel. Pruning required the most time prior to harvest with spraying second. Practically all the growers used a complete fertilizer in spite of experimental evidence that nitrogen is a principal limiting element. The doubt is expressed that either phosphorus or potash has any direct influence on apple color. Sod mulch used in 10 of the 12 orchards was less costly than tillage. An effective type of spraying in which one man rides the top of the tank is discussed.

Soils in relation to fruit growing in New York.—III, Some physical and chemical properties of the soils of the Hilton and Morton areas, Monroe County, and their relation to orchard performance, J. Oskamp and L. P. Batjer (*New York Cornell Sta. Bul. 575 (1933), pp. 34, figs. 16*).—Contributing further (E.S.R., 69, p. 53) to the general study of the relation of soil to fruit growing, intensive laboratory investigations were made of certain physical and chemical properties of the soil taken from orchards. The results of mechanical analyses suggested that wherever total colloids are no greater in the B_1 than in the A_1 horizon internal drainage conditions are favorable for fruit growing, and that where the B_1 layer has more total colloids conditions as to favorable drainage are questionable. The relative permeability of the A_1 and B_1 horizons, as determined by the rate of percolation, appeared to be a useful guide to conditions in the field. Wherever percolation was 2.5 times or more as rapid through the A_1 as the B_1 layer water-logging sufficient to injure orchard trees usually occurred.

A relatively high percentage of saturation with bases, of the profile as a whole or of the surface soil, was in the area studied associated with slow drainage and low producing orchards. On the other hand a relatively low saturation was associated with rapid drainage and high productivity. Soil reaction as indicated by pH determinations was found sufficiently correlated with percentage saturation with bases as to serve as a guide to drainage conditions. Slow drainage rather than low fertility is deemed the limiting factor to orchard production in the area covered.

A preliminary report on root growth studies with some orchard trees, C. F. Kinman (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 220–224*).—Observations at 2-week intervals on the root growth of plum, peach, and apricot trees at Chico, Calif., showed the maximum average extension for Myrobalan plum, peach, and apricot in the fortnight periods ended April 13, May 4, and July 4, respectively. The Myrobalan plum and the peach blossomed from 3 to 4 weeks after the first new roots appeared, with a lesser interval for apricot. In a later experiment where olives were included, new roots of this species were observed March 28 as compared with March 7 for apricot. The greatest seasonal activity of roots preceded the trees' critical period of need during fruit setting and leaf development, and it is suggested that this fact should be considered in formulating cultural treatments.

The rooting habit of deciduous fruits on different soils, J. Oskamp (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 213–219, figs. 2*).—An examination by means of excavations dug at right angles to the general root spread showed that root development of the Baldwin apple, Montmorency cherry, Elberta peach, Bartlett pear, and Italian prune is largely influenced by the character of the soil. There were apparently as great or greater differences in depth of rooting between trees of a single species on different soils as between different species on a single soil. For example in four different New York soils, which are briefly described, the percentage of Montmorency cherry roots growing in the first soil foot were, respectively, 37.8, 61.9, 38.4, and 73.8. In one of the soils 9 percent of the roots occurred in the fifth foot as compared with none or practically none in the other three soils. Except in the case of the prune, the depth of rooting and stand of trees was apparently associated with the soil profile.

Response of fruit tree growth to the soil complex reached by the roots, J. O. Veatch and N. L. Partridge (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 208–212, figs. 2; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 45, 46*).—Discussing various soil profiles used extensively for orcharding in Michigan, the authors illustrate the root development of fruit trees on four soil types and suggest the probable causes for the different types of development. Although variations in the nature of the soil horizons may cause differences in the distribution and extent of roots, the chief concern in fruit production is said to be that the roots reach sufficient permanent supplies of water and minerals. In dry sands the roots extended farther laterally and vertically than in moist soils containing more silt and clay, yet tree growth was less on the sandy soils, except where the subsoil was imperfectly drained. The presence of an acid hardpan had an unfavorable influence on root development and indirectly on the tree. Considering the soil as a complex, the most valuable correlations are to be established between tree growth and soil type rather than with any single soil condition, such as pH relations.

Twenty-five years of orchard soil fertility experiments, F. N. Fagan, R. D. Anthony, and W. S. Clarke, Jr. (*Pennsylvania Sta. Bul. 294 (1933), pp. 19, figs. 8*).—Presented in the form of a lecture tour of the experimental orchard planted in 1908, the authors outline the experiments in progress, follow developments through the years, and point out results.

The outstanding observation appeared to be the importance of organic matter in the soil as related to growth and yield. Treatments, whether chemical fertilizers, stable manures, or cover crops, are said to have influenced yields chiefly by changing the organic matter content of the soil. Those treatments which produced larger cover crops ultimately increased the yield of fruit. Organic matter, as determined particularly in the drought years of 1929 and 1930, proved an important factor in influencing the moisture content of the soil, those with the larger organic matter content retaining the most moisture.

Topography of the orchard site played an important part, for in certain instances mild slopes created nearly as great differences in growth and yield as any of the treatments. The depth of soil is also involved.

Comparing sod and tillage, it was found that moisture conditions may often be more favorable in sod orchards. There was less run-off on the sod, and after mowing in midsummer less water was actually required by sod than by a heavy cover crop. The annual application per tree of 10 lb. of nitrate of soda or equivalent nitrogen in other forms proved profitable, and superphosphate in moderate quantity increased grass and cover crop growth. No marked differences in total yields were observed between York Imperial, Stayman Winesap, and Baldwin, the three varieties constituting the orchard.

Ammoniated phosphorus and calcium cyanamide experiments with apple trees, F. Hofmann (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 235–237*).—In studies conducted by the Virginia Experiment Station in a 20-year-old apple orchard, the soil of which was particularly deficient in phosphorus, applications of 5 lb. or more per tree of calcium cyanamide killed all the ground cover—plantain, dandelion, lespedeza, bluegrass, etc.,—beneath the trees and where applied in excess of 5 lb. caused marginal leaf scorch in August. The apple foliage was, however, greener with all applications of cyanamide than in the control trees. On the other hand applications of ammoniated phosphorous 13 lb. per tree in the spring stimulated the growth of ground covers and promoted terminal growth and size of the new fruit buds. The average yield per tree for the ammoniated phosphorus treatment was 208 lb., as compared with an average of 52.5 lb. in the highest yielding cyanamide plat and

12.5 lb. for the checks. Where superphosphate was applied with the cyanamide better ground cover resulted than where the cyanamide was used alone.

The assimilation of carbon dioxide by apple leaves as affected by ringing the stem, A. J. HEINICKE (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 225–229 fig. 1*).—The leaves of McIntosh trees, growing in the greenhouse in 10-in. pots and in beds and ringed by removing 5 mm width of bark, were found in studies at Cornell University using a specially devised apparatus (E.S.R., 68, p. 744) to be less efficient photosynthetically than those of comparable unringed trees. The extent of the reduction varied somewhat but ranged between one third and one half of normal. It is suggested that the reduction may have been due to an accumulation of the products of photosynthesis and possibly to a deficiency of water and nutrients in the soil. Apparently fewer leaves on unringed branches are as effective as more on ringed limbs, suggesting that experiments involving the relation of leaf area to fruit development should take this reduction into consideration.

Relation of leaf area to fruit size and food reserves in apple seeds and branches, A. E. MURNEEK (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 230–234, fig. 1*).—Analyses at the Missouri Experiment Station of samples taken in late fall of ringed limbs of King David and Ben Davis apple trees, the foliage of which had been adjusted in early summer to 10 to 75 leaves per fruit, showed a decrease and increase, respectively, in the percentage of total nitrogen in the new and old growth of the twigs with an increasing number of leaves. There was a striking increase in starch with an increased number of leaves in both the new and old wood. On both ringed and unringed branches the fruit increased in average diameter and weight with increased foliage. Except in the 10-leaf group there was no significant effect of leaf area on average weight or percentage of dry matter in the seeds. The percentage of nitrogen increased in the seeds up to and including the 30-leaf group, followed by a slight decrease above this point. Ether-extracted fat in the seeds decreased rather consistently with increased foliage. Beyond 30 leaves there was a conspicuous increase in the diameter of the older wood and size of buds above the ring. The difference in nitrogen content between the wood in the various leaf groups is believed related to the earlier maturity of the foliage on the large leaf groups and the consequent release of nitrogen.

The inflorescences of apple trees.—II, An historical review together with further varietal descriptions, R. T. PEARL (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 9–17, figs. 3*).—Supplementing an earlier paper (E.S.R., 68, p. 479) in which was pointed out the possible value of flowers in identifying apple varieties, the author presents a historical survey of the literature on the subject and some additional descriptions of the flowers of better known varieties of apples. A glossary is included of terms used in describing records.

Freezing injury to the roots and crowns of apple trees, H. E. THOMAS and L. H. MACDANIELS (*New York Cornell Sta. Bul. 556 (1933), pp. 23, figs. 9*).—Whereas the killing of roots and crowns by low temperature is deemed the major cause of high mortality in apple orchards in northern States, there are several contributory factors, such as inadequate nutrition, poor drainage, foliage injury, time of severe freezing, nature of the rootstock, and cultural treatments. Thees only partially girdled by freezing injury often recover without treatment.

Based on extensive experiments with several varieties of apples, the authors conclude that treatment of injured trees by bridge grafting or approach grafting may or may not be worth while, depending on the location of the orchard, age of the trees, severity of the injury, etc. It is conceded a waste of time to treat trees which are wholly girdled at the crown unless they can be bridge grafted. The ultimate solution of the problem is believed to lie in the development of cold resistant rootstocks, and already it is recognized that there are marked variations in resistance. Observations on a few varieties on their own roots showed rather distinctive types of growth.

Among precautions that may be taken to decrease the hazard of winter injury to roots and crowns are (1) the maintenance of sod, mulch, or other cover during winter, (2) no exposure of the crowns in late fall without adequate recovering, (3) the use of root-grafted rather than budded trees, and (4) double working of tender varieties on a hardy intermediate stock.

The value of ice in reducing fall temperatures in an air-cooled apple storage in southern Indiana, C. E. Baker and I. D. Mayer (*Indiana Sta. Bul. 379 (1933), pp. 16, figs. 3*).—Investigations conducted at the Moses Fell Annex Farm, Bedford, over a period of years indicated that such varieties as Grimes Golden, Jonathan, and Delicious could be held satisfactorily into late autumn by the use of ice-cooled storage, whereas air-cooled storage did not suffice to hold these varieties in marketable condition. The circulation of air over large blocks of ice reduced the storage temperature by 10° to 16° F. below that of a comparable air-cooled chamber. The circulation of air through cracked ice and salt lowered the temperature 18° to 22° below that of a similar but noninsulated air-cooled room. A temperature of 40° was attained with ice and salt but with an average approximating 45°. Ice had the added advantage that its melting provided sufficient moisture to keep the fruits in good physical condition, whereas in the air-cooled chambers in dry seasons the fruit shriveled badly despite wetting the floor.

The profitableness of using ice for cooling apples is said to depend on prevailing prices, especially the increase in price from midseason to late. A description is offered of the bunker for utilizing cracked ice and salt, and data on the cost of icing during the several years are included.

Certain physiological responses of Comice pears during cold storage, F. Gerhardt and B. D. Ezell (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 291–294, figs. 2*).—Comice pears stored at 32° F. immediately after harvest and after 1 week's delay at 65° were studied by the U.S. Department of Agriculture with respect to physiological changes in progress in storage.

In both lots there was noted a tendency for total solids, firmness of the fruit, and total acid to decrease during long periods of storage, with a rather significant softening just prior to the time the pears lost their capacity to ripen normally. This stage was reached about 2 months earlier in the delayed lot. Respiration data showed a similar procedure, that is, both delayed and immediately stored fruits failed to ripen normally once normal respiraton had ceased. This cessation was preceded by an accumulation of acetaldehyde and ethyl alcohol in the tissues. Whether these volatile compounds were causative factors or merely associated with the cessation of respiration is conjectured. However, it is suggested that a determination of these compounds should be useful as an index to the remaining storage life of pears.

Varietal adaptability of peaches to freezing in small consumer packages, J. S. Caldwell, J. M. Lutz, H. H. Moon, and A. T. Myers (*Fruit Prod. Jour. and Amer. Vinegar Indus., 12 (1933), No. 12, pp. 366–371, fig. 1*).—In studies conducted by the U.S. Department of Agriculture a total of 56 peaches, 34 yellow-fleshed freestones, 18 yellow-fleshed clingstones, and 4 white freestones, harvested when fully ripe, peeled in lye solution, and packed in a 50 percent sugar sirup in two types of containers were frozen and stored for 6 months at from 16° to 18° F. Nine varieties, Chairs, J. H. Hale, Reeves, Up-to-

Date, St. John, Eclipse, Oriole, Primrose, and a sport of J. H. Hale proved superior. Of these Oriole and Primrose were outstanding in appearance because of very little discoloration, even in the container which admitted air. In most of the varieties discoloration occurred on the top of the fruit in the unsealed packages. Comparisons of rapid v. slow freezing in Early Crawford, Elberta, Up-to-Date, and Late Crawford showed considerably more deterioration when frozen rapidly at 10° than slowly at 17°.

Fertilizing the peach orchard, R. E. MARSHALL (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 31–34*).—Data taken at the Graham Horticultural Experiment Station on Gold Drop peach trees, part planted in 1921 and part in 1922, and fertilized with nitrogen as follows—(1) applied in spring just after frost left the soil, (2) just after blooming, (3) early September, and (4) just preceding the initiation of fruit buds—showed no significant effect of any fertilizer treatment on the weight of prunings until 1926. From then to 1930 when the experiment closed the fertilized trees produced significantly greater amounts of prunings. Differences between the four nitrogen treatments were not marked. Concerning the effect of time of applying nitrogen on yield, production was approximately equal in treatments 3 and 4, and both were significantly higher than the early and late spring applications. Furthermore, the percentage of peaches above 2 in. in diameter was considerably larger with treatments 3 and 4.

Plum pollination studies, W. H. ALDERMAN and E. ANGELO (*Minn. Hort., 61 (1933), No. 7, p. 130*).—A graphic summary of pollination results secured by the Minnesota Experiment Station in 1932 and 1933 shows that nearly all the hybrid plums commonly grown in Minnesota are worthless as pollinizers. Toka, Hanska, and Kaga proved, however, capable of pollinating certain hybrids. Desoto, Surprise, Wolf, and Wyant gave excellent results with practically all the large-fruited hybrids. Goldenrod failed to produce a single fruit with any of 26 pollinizers tested. Among plum-cherry hybrids Compass and Nicollet gave the best results as pollinizers within the group. Information on the comparative blooming seasons of the various plums is included.

Gentes Herbarum.—Art. 3, Blackberries of the lower South, L. H. BAILEY (*Ithaca, N.Y., 1933, vol. 3, No. 3, pp. 119–148, figs. 9*).—Stating that the southern *Rubus* species are badly confused because of incomplete herbarium material and field studies, the author presents a tentative classification for the group based on personal collections in the area and on herbarium specimens. One of the difficulties attached to the study was that canes differ sharply in external characters between the season of initial development and the subsequent fruiting year.

Raspberry varieties, G. L. SLATE (*N.Y. State Hort. Soc. Proc., 78 (1933), pp. 290–295*).—Descriptive information and comments on behavior are given for a number of red raspberries, including such varieties as Viking, Newburgh, Lloyd George, Chief, and Ranere.

Transpiration rates and suction forces of fruiting canes and current season shoots of the black raspberry, R. E. MARSHALL (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 295–299, figs. 3; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 46*).—Measurements taken at the Michigan Experiment Station on the water intake of excised fruiting canes and current season shoots of the black raspberry placed in June in potometers in the greenhouse showed means of 0.0239 cc and 0.0175 cc per square centimeter of foliage per hour for the new and old canes, respectively. The mean differences in transpiration rates of shoot and cane foliage were constant throughout the season. The mean suction forces or pulls for shoot and cane foliage were 40.6 cm and 32.8 cm, respectively.

The water requirement of young shoots increased with the advance of the picking season, and since they showed greater capacity to pull water it is believed that a substantial change takes place in the physiological relationship between old canes and current season shoots. Apparently fruiting canes cannot compete with young shoots in obtaining water during periods of drought or stress, such as occurs at the end of the fruiting season.

Changes in composition of Florida avocados in relation to maturity, A. L. Stahl (*Florida Sta. Bul. 259 (1933), pp. 61, figs. 13*).—Of various chemical and physical characteristics studied in different varieties of avocados harvested at various stages of maturity, changes in oil and fat content were most consistent and most clearly defined. Changes in sugar, protein, and ash contents were too small and variable to serve as indexes to maturity. Moisture content decreased with the development of the fruit but was affected by rainfall. Specific gravity was found closely related to fat and oil contents, decreasing as these constituents increased. Satisfactory maturity was reached in the Guatemalan and hybrid varieties when the specific gravity of the whole fruit reached 0.98 or lower and in the West Indian or early maturing varieties when 0.96 or less. At this stage the fat content of the Guatemalan avocados was more than double that of the West Indian varieties.

No physical characteristic could be associated closely with maturity, and even the pressure tester proved of no value despite its success with certain other fruits. Where a lot of avocados was divided and part analyzed immediately and part held in storage until soft, there was noted an appreciable increase in oil and fat and hydrolyzable sugars and a decrease in specific gravity, moisture, and free reducing and total sugars in the stored lot.

The storage behaviour of limes, C. W. Wardlaw (*Trop. Agr. [Trinidad], 10 (1933), No. 9, pp. 246, 247*).—In studies conducted at the Imperial College of Tropical Agriculture, Trinidad, it was found that a temperature of 45° F. is more favorable than 40° for the storage of limes. At 40° several varieties were subject to pitting or blotching of the skin. At tropical temperatures, limes lost weight at the rate of 1 to 2 percent per day, but up to 12 to 14 percent moisture loss showed no marked shriveling. Cellophane or wax-impregnated wrappers proved useful in slowing down this weight loss.

The relation of the root system of pecan trees to nursery and orchard practices, J. G. Woodroof (*Georgia Sta. Bul. 176 (1933), pp. 15, figs. 8*).—In presenting the results of an intensive study of the root system of pecan trees of various ages from the seedling to maturity, the author states that the greatest concentration of feeding roots is just below the surface and that consequently cultivation may destroy many of these roots and should be shallow, particularly during the growing season. Roots spread about twice as far as branches, so that interlacing occurred long before the branches met. Feeding roots were found very sensitive to drought, freezing, insufficient air, and other adverse conditions but to possess a remarkable capacity for renewal on the return of favorable environment. Root cuttings grew readily and should serve as a means of propagation.

Results of pecan pruning experiments, H. L. Crane (*Ga.-Fla. Pecan Growers Assoc. Proc., 27 (1933), pp. 11–16*).—In this further report (E.S.R., 68, p. 623) on pruning investigations conducted by the U.S. Department of Agriculture at Albany, Ga., the author points out that with no exception pruning of bearing pecan trees which had never been pruned before resulted in longer and stockier new shoots as compared with those of comparable unpruned trees. In the case of weak, neglected trees the percentage of shoots producing pistillate blossoms was increased by pruning, and the percentage of pistillate blooms which set nuts was higher in most cases following pruning. To an appreciable extent the size of the nuts and the development of the kernels was benefited by pruning, and spraying was facilitated by the lowering and thinning out of the top.

Pecan cold storage experiments, G. H. Blackmon (*Ga.-Fla. Pecan Growers Assoc. Proc., 27 (1933), pp. 6–10*).—Results of studies at the Florida Experiment Station, in which Curtis and Stuart pecans were stored at 0°, 32°, 37°, 42°, 48°, 54°, and 60° F., indicated that pecans can be kept in edible condition for at least 17 months when placed as soon as well cured in storage at 32° or slightly above. There was little change in the weight of nuts held at 32° or 37° during the 17 months. Following storage the nuts kept in good condition long enough to permit of their distribution and use.

Pyrethrum investigations in Colorado.—I, Preliminary report on factors affecting pyrethrin content, C. B. Gnadinger, L. E. Evans, and C. S. Corl (*Colorado Sta. Bul. 401 (1933), pp. 19, fig. 4*).—No marked effect on pyrethrin content was noted in a comparison of seven methods of drying pyrethrum flowers. The highest percentage (1.28) on a moisture-free basis was found in the lot dried in full shade. In the case of blossoms cut at the same stage of maturity those harvested in the middle stages of the plant's blooming period apparently had a somewhat higher pyrethrin content. Shading the plants greatly decreased the pyrethrin content of the blooms. When held below 32° F. there was no loss in pyrethrin of dried flowers during a 6-month period. The pyrethrin content of flowers was little different whether dried with or without the stem.

Plants varied greatly in their number of blooms and in the percentage content of pyrethrin in their flowers. In a lot of 39 plants the yield ranged from 70 to 543 blooms, and the percentage of pyrethrin on a moisture free basis from 0.9 to 2.07 percent, the average being 1.27 percent. No definite plant character was observed that could be correlated with pyrethrin yielding capacity.

Artificial propagation of the lily, D. Griffiths (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 519–521*).—At Bellingham, Wash., scales of 11 species of lilies dug in late March were removed and placed in a moist incubation chamber at 79° F. *Lilium candidum* and *L. testaceum* scales began to form bulblets in less than 2 weeks, with all species starting within 3 weeks. Planted in the field on May 10, *L. candidum* and *L. regale* bulblets made the greatest top growth. A whole season was gained by the artificial methods employed.

FORESTRY

Distribution and rate of fall of conifer seeds, H. W. Siggins (*Jour. Agr. Res. [U.S.], 47 (1933), No. 2, pp. 119–128, figs. 3*).—Tests conducted with conifer seeds in the quiet air of the central elevator shaft of the bell tower on the University of California campus indicated that seeds of each species have a characteristic average rate of fall. In the case of 12 pine species there was a general tendency for the heaviest seeds to fall most rapidly, but in the case of 8 lots of loblolly pine (*Pinus taeda*) there appeared to be a slight negative correlation between the weight of seed and rate of fall.

Observations on the liberation of seeds from cones showed that several days elapse ordinarily between the escape of the first and last seeds from any one cone and that various cones on a tree do not open simultaneously, thus providing an opportunity for distribution of seed in several directions. However, where the winds are largely from one quarter the area seeded will be in the form of an elongated V. Due allowances must also be made for the large quantities of seeds destroyed by rodents.

DISEASES OF PLANTS

Twelfth annual report of the Canadian Plant Disease Survey, 1932, compiled by I. L. CONNERS (*Canada Expt. Farms, Div. Bot., Ann. Rpt. Canad. Plant Disease Survey, 12 (1932), pp.* [2]+*112*).—Several diseases new for Canada are reported in this mimeographed publication, especially of bulbs and ornamentals, the most important of which was the epidemic of bacterial blight or Stewart's disease of sweet corn in western Ontario.

Further cytological studies of heterothallism in Puccinia graminis, R. F. ALLEN (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 1, pp. 1–16, pls. 6*).—More intensive studies (E.S.R., 63, p. 145) of the surface hyphae and related details in *P. graminis*, made by the U.S. Department of Agriculture cooperating with the California Experiment Station, revealed that the development of the gametophyte generation of *P. graminis* varies greatly with the age of the barberry leaf in which it is growing. In very young, tender leaves individual hyphae grow freely to the surface of the leaf. Barberry leaves rapidly become tough and resistant as they approach maturity and the epidermal walls thicken. Surface hyphae already formed between epidermal cells die and disappear, and new surface hyphae form with increasing difficulty or fail to develop altogether. Only the massed attack of many hyphae at a spermogonium succeeds in breaking out through the epidermis. Fertilization at the upper leaf surface takes place by the entrance of spermatia at the spermogonia. Considerably later, when the growth of the rust and the hypertrophy of the leaf tissues it induces place the inclosing epidermis under tension, stomata in the lower epidermis open widely and become filled with hyphae, which probably serve as receptive hyphae.

A disease of cassava in Santo Domingo, I, II [trans. title], R. CIFERRI (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 13 (1933), No. 2, pp. 227–240, pls. 4, fig. 1, Eng. abs., p. 239; pp. 241–308, pls. 7, figs. 11, Eng. abs., pp. 305, 306*).—The author gives notes on the climatic, meteorological, edaphic, and topographic conditions of the industrial culture of cassava in Santo Domingo and the most outstanding distinctive characteristics of the three main groups of cassava.

The circular leaf-spot disease of cassava is fully described. The causal agent is *Helminthosporium hispaniolae*, a fungus closely allied to the Brazilian *H. manihotis*. Characteristics of the fungus in nature and in culture are given, as well as notes on the geographical range, distribution throughout the year, and varietal susceptibility. Varieties showing violet, bluish, or brownish young leaves are more resistant than those with green or yellowish-green bud leaves. Under natural conditions, immature leaves are very resistant or immune to the disease. A significant, moderately high, positive correlation between surface area of spots and rainfall was found. The disease is not of primary importance and no methods for artificial control are proposed.

Growth of the cotton root-rot fungus in synthetic media, and the toxic effect of ammonia on the fungus, D. C. NEAL, R. E. WESTER, and K. C. GUNN (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 2, pp. 107–118, figs. 6*).—When ammonium sulfate or nitrate supplied the nitrogen in Duggar's solution at a concentration of about 12.4 g of nitrogen per liter, very little growth of the mycelium appeared after intervals of 11, 18, and 31 days, whereas with calcium nitrate, potassium nitrate, and sodium nitrate abundant growth was produced. Except in cultures supplied with ammoniacal nitrogen, pH exponents of the filtrates increased as growth of the fungus progressed.

The toxic effect of ammonia on the fungus was confirmed by other tests, the mycelium being killed with ammonium hydroxide at a concentration as low as

500 p.p.m. after 20 minutes' exposure. Gas liberated from 28 percent ammonia water also killed the mycelium in 30 seconds and inhibited germination of root rot sclerotia after exposures of 10, 15, and 20 seconds. Sclerotia also were killed in 5 minutes by 1 percent solutions of ammonium hydroxide. The growth of mycelium from root tissues of infected cotton plants was prevented by exposure to ammonia for 1 minute in the laboratory. In field tests 6 percent solutions of ammonium hydroxide applied to soil around the roots of infected plants usually killed the mycelium, whereas growth was abundant from the checks. Mature plants treated during August, September, and October with 4 and 6 percent solutions of ammonium hydroxide were not killed, although they were injured considerably in the cortical and cambium tissues of the roots. The results suggested the possible utilization of ammonia or ammonium compounds for control of the disease in cotton fields and for protecting susceptible ornamentals.

Plaster molds occurring in beds of the cultivated mushroom, V. K. Charles and E. B. Lambert (*Jour. Agr. Res.* [*U.S.*], *46* (*1933*), *No. 12, pp. 1089–1098, figs. 4*).—Among diseases causing serious losses to mushroom growers are white plaster mold and brown plaster mold. The former organism, penetrating deeply into the mushroom bed and giving compost the appearance of having been dusted with flour, is here identified with *Monilia fimicola*, described by Constantin and Matruchot in 1894. Brown plaster mold, typically a surface organism and distinguished by a cinnamon brown color at maturity, is recognized as being identical with *Myriococcum praecox*, a fungus described by Fries in 1823.

Another species, *Monilia sitophila*, appears troublesome as a contaminant in the manufacture of mushroom spawn, but is not believed capable of competing successfully with the microbial flora in well composted manures, and is seldom if ever found in composted manure with the plaster molds.

Variability in the pea-wilt organism, Fusarium orthoceras var. pisi, W. C. Snyder (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 2, pp. 65–88, figs. 8*).—Utilizing susceptible pea varieties growing upon soils artificially inoculated with several strains of pea wilt (*F. orthoceras pisi*), no differences were noted at the Wisconsin Experiment Station in the kind of pathogenicity resulting. However, strains varied somewhat as to the degree of pathogenicity. The same results were observed with variants developed from monoconidial cultures. No resistant pea variety was found susceptible to any culture nor any susceptible variety resistant to any fungal strain.

From the physiological standpoint differences in colony characters were apparent between original isolations of the fungus from the different regions and also between strains built up from single conidia. Type strains exhibited the same general temperature requirements upon artificial media, but pronounced distinctions were observed with respect to quality, intensity, and rate of pigmentation of the medium. No strain was found sufficiently divergent from type to justify the creation of new nomenclature, and in fact it appeared that existing nomenclature might be condensed and simplified to a certain extent.

Groundnut rosette disease in the Gambia, T. R. Hayes (*Trop. Agr.* [*Trinidad*], *9* (*1932*), *No. 7, pp. 211–217, figs. 4*).—Three types of rosette diseases were observed in Gambia. By altering agricultural conditions incidence is reduced, and various methods for carrying this into practice are suggested.

Weeds as possible carriers of leaf roll and rugose mosaic of potato, T. P. Dykstra (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 1, pp. 17–32, figs. 8*).—The host range and the symptoms of leaf roll, rugose mosaic, veinbanding, and the latent virus of apparently healthy potatoes on different solanaceous weeds and cultivated plants was studied in Oregon by the U.S. Department of Agriculture. Leaf roll was transmitted by the aphid, *Myzus persicae* (Sulz.), from the potato to *Solanum villosum*, *S. dulcamara*, *Datura stramonium*, *D. tatula*, and *Lycopersicon esculentum*. Rugose mosaic was transmitted by leaf mutilation from the potato to *S. villosum*, *Physalis* sp., tomato, and petunia. From potatoes infected with rugose mosaic, *M. persicae* transmitted only the veinbanding component of this virus complex. *M. persicae*, *Epitrix subcrinita* Lec., *Empoasca* sp., *Lygus pratensis* (L.), *Philaenus spumarius* Fall, and *Nabis alternatus* Parsh., naturally occurring on the potato, failed to transmit the latent virus of apparently healthy potatoes to jimsonweed.

Copper seed treatments for the control of damping-off of spinach, P. P. Pirone, A. G. Newhall, W. W. Stuart, J. G. Horsfall, and A. L. Harrison (*New York Cornell Sta. Bul. 566 (1933), pp. 25, figs. 14*).—Losses from damping-off fungi are said to range from almost 0 to 100 percent and to occur on both muck and upland soils of New York State. One organism, *Pythium ultimum*, found most frequently associated with damping-off was proved pathogenic and is deemed particularly harmful because fields once infested remain so for several years. Excellent growth of the fungus on potato-dextrose agar was secured at 32° C. (89.6° F.), no growth at 38°, and very slow development at 9°.

Excellent control was secured in greenhouse and field on both muck and upland soils by a preplanting treatment of the seed with either 1 percent copper sulfate solution or cuprous oxide powder at the rate of 1 level teaspoonful to 1 lb. of seed. The increased yield from the two best copper treatments averaged more than 200 bu. per acre. Beet, chard, cucumber, melon, squash, tomato, eggplant, pepper, lima bean, and pea plants also responded favorably to the copper seed treatments.

Morphology of reproduction in Ceratostomella fimbriata, C. F. Andrus and L. L. Harter (*Jour. Agr. Res. [U.S.], 46 (1933), No. 12, pp. 1059–1078, pls. 2, figs. 6*).—*C. fimbriata*, a Pyrenomycete causing black rot of sweetpotatoes, is described as producing two types of endoconidia and perithecia with 8-spored asci. Numerous single-spore cultures gave no evidence of sexual strains. Study of the perithecial stage revealed a number of features contrasting strongly with descriptions of a conventional Ascomycete. An antheridium is present, but the oogonium develops parthenogenetically. No nuclear fusion occurs in the oogonium. No ascogenous hyphae are formed in the perithecium, The unwalled oogonium fragments and the daughter cells in turn divide to form numerous binucleate-free cells that develop into asci. In ascus formation, the paired nuclei fuse and the wall of the fusion nucleus becomes the wall of the ascus. Multiplication of asci by division of unwalled and unattached protoplasts is regarded as an ordinal character. The cytological features are described in detail.

Intracellular bodies associated with ring-spot, M. W. Woods (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 419–434, figs. 2*).—Intracellular bodies, very similar to those associated with several plant virus diseases, are described as occurring in connection with the primary and systemic lesions of ring spot in *Nicotiana tabacum* (Turkish) and primary lesions in *N. tabacum* (Havana Seed-Leaf), *N. rustica*, *N. glutinosa*, and *Petunia* sp. The intracellular bodies are described with reference to structure, inclusions, position in the cells, and distribution within the diseased leaves. Evidence is presented to demonstrate the purity of the ring-spot virus used, and the freedom from contamination in the experimental plants.

The development of intracellular bodies seems to bear a direct relationship to the formation of visibly lesioned areas in the leaf by the virus. The rapidity with which the intracellular bodies develop after inoculation seems to depend more upon the physiological condition of the suscept cells at the time of inoculation than upon the length of time that the virus remains in the cells. The intracellular bodies observed bear resemblance to masses of cytoplasm.—(*Courtesy Biol. Abs.*)

[Tomato diseases in Maryland], I–III (*Maryland Sta. Bul. 345* (*1933*), *pp. 447–494, figs. 4*).—These studies are reported in three parts.

I. *The mosaic disease of tomatoes*, J. W. Heuberger and J. B. S. Norton (pp. 447–486).—Following a brief discussion of the causes and symptoms of tomato mosaic, the authors present the results of various inoculation, physiological, and control experiments. Under conditions of short day length and low light intensity leaf abnormality symptoms were produced in young tomato plants inoculated with ordinary tobacco mosaic, but under like conditions cucumber mosaic rarely produced manifestations. Inoculation of tomato seeds or hypocotyls of seedlings before the chlorophyll was developed were unsuccessful. Evidence was secured that cultural operations tend to spread tomato mosaic, and that care in handling plants, such as washing the hands with soap, tended to reduce the spread.

Mosaic had little effect on yield in the case of well grown greenhouse tomatoes. Field trials showed that early infections reduce yield more than do late infections. Both green and dry weight of diseased plants were reduced as compared with healthy plants. After an initial drop leaves of mosaic infected plants transpired more rapidly than did those of healthy plants.

II. *Fusarium wilt of tomatoes*, J. B. S. Norton (pp. 487–489).—A brief account is presented of the nature, occurrence, and effects of the disease and of efforts made to combat the trouble by the selection of resistant strains. It is pointed out that resistant varieties are not immune and often show internally the characteristic darkened woody ring in the stems.

III. *Tomato diseases and their control*, J. B. S. Norton and H. A. Hunter (pp. 490–494).—Brief comments are made on various tomato diseases resulting from fungi, bacteria, nematodes, and nutrient deficiencies, with suggestions as to control.

Vegetable diseases: A brief summary ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 68* (*1933*), *pp. V+38*).—This is an inventory, or annotated list, of the chief fungus and allied troubles that affect vegetable crops in Great Britain. based on information gathered over many years by the Ministry's plant pathological laboratory. To each disease the now standardized common name is given, and the scientific name of the pathogen or causal agent (where one is concerned) is added. Short descriptions of the symptoms of the more important diseases are supplied, and where control measures are known, these are briefly indicated.

Fire blight of pear and apple, H. E. Thomas and K. G. Parker (*New York Cornell Sta. Bul. 557* (*1933*), *pp. 24, pl. 1, figs. 9*).—Designed primarily for the fruit grower, this paper presents a summation of present knowledge concerning plant hosts, manner of overwintering and dissemination, methods of control, etc. A total of five species of hawthorn (*Crataegus*) are added to the list of suscepts, and certain data based on field experiments are presented on the results and costs of control operations. That aphids are important vectors of the disease was indicated in a very striking increase in blighted spurs and terminals during the period July 15 to August 25 when aphids were present in the pear orchards in large numbers. Under the conditions of the tests, fair to good control was obtained in a commercial pear orchard in western New York over a 5-year period at an annual cost little different from that of the cost of a single spray application.

Studies in the genera Cytosporina, Phomopsis, and Diaporthe.—IV, On the pathogenicity of certain strains of Phomopsis and Diaporthe, S. N. Das Gupta (*Ann. Bot.* [*London*], *47* (*1933*), *No. 186, pp. 385–400, figs. 5*).—The investigation deals chiefly with the power of certain species of *Phomopsis* and of *Diaporthe* to attack the apple fruit, and supplements that already described for *C. ludibunda.* The attacking powers of all the fungi investigated in this and the previous paper are compared.

The strains of *D. perniciosa* differ widely, the range of variation agreeing approximately with that recorded for *C. ludibunda* and its saltants. The range of activity shown by the remaining species of *Diaporthe* (*D. binoculata, D. faginea,* etc.) is not extensive, and these may be classed with the least active strains of *C. ludibunda.*

The species of *Phomopsis* also show a wide range of variation falling within that found for saltants of *C. ludibunda.* Only the strain *P. coneglanensis* is significantly more active than *C. ludibunda* saltants (Bramley's), but it does not differ significantly from some strains of *D. perniciosa.*

Comparisons are rendered difficult by the effects of age of fruit and variety of apple on rate of attack by the fungi.—(*Courtesy Biol. Abs.*)

The belated or sterile scab of pear leaves and its significance in the overwintering of pear scab organisms [trans. title], R. Wiesmann (*Schweiz. Ztschr. Obst- u. Weinbau, 42* (*1933*), *No. 2, pp. 18–23, figs. 4*).—A nearly sterile kind of pear scab (*Venturia pyrina* Aderh.) is described, which occurs in the fall and which attacks not only the nonresistant pear leaves but also those less susceptible to the disease and causes them to drop before the proper time. The diseased leaves show no autumn coloring. The investigations prove that under Swiss conditions the belated or sterile scab has no importance for the hibernation of the pear scab in the dead leaf. No perithecia are being produced in leaves attacked by the sterile scab, which therefore signifies merely a last and nonimportant outbreak of the disease at the end of the season. Conclusions are drawn from the observations made, and the morphology of the sterile scab, which appears often epidemically, is described in detail.—(*Courtesy Biol. Abs.*)

Diseases and insect pests of currants, raspberries, and strawberries [trans. title], P. Hus (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 70* (*1933*), *pp. 41, pls. 6*).—A handbook of general information.

The relation of types of pruning to the control of coniothyrium cane blight, C. F. Williams and R. F. Poole (*North Carolina Sta. Bul. 291* (*1933*), *pp. 14, figs. 7*).—Stating that a very large amount of cane blighting and inferior quality of Lucretia dewberries results from injury by the *coniothyrium* fungus (*Leptosphaeria coniothyrium*), which gains entrance to the tissues through pruning and other wounds in the aboveground stems, the authors discuss the results of experiments upon the effects of different types of summer pruning and the control of the disease. Despite the drastic curtailment of growing parts, the cutting immediately after harvest of all canes just below the surface of the soil gave excellent results primarily because of disease control. Where such pruning was practiced every year yields were not reduced, and were, in fact, after the initial season considerably higher than those obtained by the ordinary grower's type of pruning. Treatment of wounds and stubs with disinfectants failed to give worth while results. Adverse climatic conditions, such as wet or dry periods, were observed to be important factors in the development of new canes following pruning. Other fungi concerned in the injury of Lucretia dewberries were root rot (*Collybia dryophila*), anthracnose (*Plectodiscella veneta*), and leaf spot (*Mycosphaerella rubi*).

Heart rot of the date palm caused by Thielaviopsis paradoxa (DeSeynes) von Höhn, R. B. STREETS (*Arizona Sta. Tech. Bul. 48 (1933), pp. 443–469, pls. 10, figs. 4*).—A description is given of the symptoms and physiology of a fungus disease found attacking the trunks and roots of the date and other palms in Arizona and California. The organism *T. paradoxa* found capable of reproducing the disease by inoculation is not considered an aggressive parasite but rather a predator on weakened plants; in fact healthy offshoots set in holes from which diseased palms had been removed did not contract the disease. However, the fungus progressed very rapidly in devitalized palms.

Among date varieties Deglet Noor was particularly susceptible, and the disease was also found on the Canary, fan, and Guadalupe palms. Apparently the fungus is world-wide in distribution and occurs on other genera of plants, including sugarcane, pineapple, and coconut. Control is said to rest largely in prevention and sanitation measures, such as the destruction of diseased palms. Cultural conditions promoting vigorous growth are obviously desirable, as is also the avoidance of deep wounds which penetrate the inner tissues.

The control of anthracnose disease of almonds, S. J. DU PLESSIS (*Farming in So. Africa, 8 (1933), No. 89, p. 296*).—Preliminary spray experiments showed that this infection with *Gloeosporium amygdalinum* can to a certain extent be controlled by spraying with Bordeaux mixture. Further tests on a larger scale, comparing various sprays, showed effective control by the following means: Picking, cutting out, and destroying all dry or mummified fruit and infected twigs during the winter, and applying Bordeaux sprays (1) when the buds start to swell, but from 2 to 3 weeks before they open (Bordeaux 4–4–50), (2) when about 75 percent of the crown leaves have been shed (Bordeaux 4–4–100), (3) 10 days after the second spray (Bordeaux 4–4–100), and (4) a fortnight after the third spray (Bordeaux 4–4–100).

Vein spot of the pecan caused by Leptothyrium nervisedum, n.sp., J. R. COLE (*Jour. Agr. Res. [U.S.], 46 (1933), No. 12, pp. 1079–1088, figs. 7*).—Asserting that vein spot appears to be one of the principal foliage diseases of the pecan in southwestern United States, the author describes the injuries caused by the fungus and discusses the morphology and physiology of the organism here named for the first time. The striking similarity of vein spot to pecan scab has led to confusion between the two. Although occurring on both native and cultivated trees, vein spot was much more common on orchard varieties. Van Deman was found the most susceptible variety in Louisiana and Kincaid in Texas.

Some evidence was seen of the existence of physiological strains of vein spot. Although no definite control experiments were conducted, it was noted that very good control of vein spot occurred where trees had been sprayed three times with Bordeaux mixture alternated with four dustings with 20–80 monohydrated copper sulfate and lime.

Further yield records in connection with Oidium heveae, R. K. S. MURRAY (*Trop. Agr. [Ceylon], 80 (1933), No. 4, pp. 209–213, figs. 2*).—The rubber yield records obtained in 1931 showed that the control of the disease obtained by sulfur dusting was accompanied by a comparable increase in yield, especially during the months in which there was the greatest contrast in the foliage between dusted and undusted fields.

In 1932 successful control in the dusted field was not obtained, and this was reflected in a decreased yield. The yield per acre was higher, however, in the dusted field than in the control, and it is believed that the benefits to the general health of the trees conferred by previous years' treatment are to some extent cumulative.—(*Courtesy Biol. Abs.*)

Dry rot in wood (*[Gt. Brit] Dept. Sci. and Indus. Res., Forest Prod. Res. Bul. 1 (1933), 2. ed., pp. VII+34, pls. 9, figs. 2*).—Part 1 of this publication is entitled Fungi Causing Dry Rot in Wood, by K. St. G. Cartwright and W. P. K. Findlay (pp. 1–15); part 2, The Detection and Practical Treatment of Dry Rot (pp. 17–24); and part 3, Precautions to Be Taken in the Use of Timber in New Buildings to Prevent Outbreaks of Dry Rot (pp. 25–34).

ECONOMIC ZOOLOGY—ENTOMOLOGY

Autumn food habits of coyotes.—A report of progress, 1932, C. C. Sperry (*Jour. Mammal., 14 (1933), No. 3, pp. 216–220, fig. 1*).—This is a report of an appraisal made by the U.S.D.A. Bureau of Biological Survey of the stomach contents of 1,453 coyotes collected in twelve western States during September, October, and November 1931 and 1932. The food of the coyote was found to consist by bulk of rabbits 29 percent, carrion 29, rodents 17, sheep and goats 14, birds 3, deer 2, skunk and badger 2, insects 1, and vegetable matter 3 percent.

The mammals of Morocco [trans. title], A. Cabrera (*Mus. Nac. Cien. Nat. [Spain], Trab., Ser. Zool., No. 57 (1932), pp. 363, pls. 12, figs. 34*).—This is a report of studies of the mammals occurring in Morocco, accompanied by colored illustrations of many.

Nematode parasites of mammals, G. W. McClure (*Zoologica [New York], 15 (1933), No. 2, pp. 29–47*).—This is a report upon specimens collected from animals in the New York Zoological Park in 1931.

The nidification of birds of the Indian Empire, II, E. C. S. Baker (*London: Taylor & Francis, 1933, pp. VI+564, pls. 6*).—This second volume of the author's work (E.S.R., 69, p. 682) deals with 12 families of passerine birds from Turdidae, or thrushes, to Sturnidae, or starlings. The nidification of 403 forms is described in the present volume. An alphabetical index to the volume is included.

Report on the distribution, migratory movements, and control of the starling (Sturnus vulgaris) in Australia, J. P. Kinghorn (*Jour. Dept. Agr. So. Aust., 36 (1933), No. 10, pp. 1154–1158*).—An account is given of the starling, which was introduced into Victoria in 1862 and is now distributed over almost the whole of the cultivated land of southeastern Australia.

The snail Pseudosuccinea collumella (Say) as a potentially important intermediate host in extending the range of Fasciola hepatica Linn., W. H. Krull (*Jour. Wash. Acad. Sci., 23 (1933) No. 8, pp. 389–391*).—The snail *P. columella*, discovered by the author to be an intermediate host for the sheep liver fluke (*F. hepatica*), has a wide distribution, occurring from Nova Scotia west to Minnesota, eastern Kansas, and central Texas, and from Manitoba and Quebec south to Texas and Florida. It is found in ponds and streams where water is more or less stagnant, a habitat in which lily pads or cattails (*Typha*) occur being especially favorable. It is pointed out that this distribution makes the snail an important host for this fluke east of the Mississippi River.

Observations with the Rife microscope of filter-passing forms of microorganisms, E. C. Rosenow (*Science, 76 (1932), No. 1965, pp. 192, 193*).—The filtrable turquoise-blue bodies of *Eberthella typhi* described by Kendall were seen by this method, although not visible by ordinary methods of illumination and magnification because of their peculiar nonstaining hyaline structure. The findings under the Rife microscope of cocci and diplococci in filtrates of cultures of the streptococcus from poliomyelitis and in filtrates of the viruses of poliomyelitis and herpes encephalitis, not detectable by ordinary methods and which resembled in form and size those found in the respective cultures, and the absence of minute forms suggest that the filtrable, inciting agent of these diseases is not necessarily extremely small, as is universally believed. Indeed, it may be the nonstaining, highly plastic, hyaline stage of the visible, stainable, cultivable organism, the streptococcus. The form, size, and color are too characteristic and true to type to permit considering them as artifacts. The noninfectivity of filter-passing forms, except in virus diseases, their presence in larger numbers in filtrates of cultures or infected tissues, and the great difficulty in obtaining the visible forms in cultures of filtrates indicate that "invisible" filter-passing forms represent a certain stage in the development of micro-organisms.

Preliminary studies of insect parasites in Indiana, B. E. MONTGOMERY (*Canad. Ent., 65 (1933), No. 8, pp. 185–190*).—Notes are here given on parasites reared from field-collected material by the author while working at the Indiana Experiment Station during the summer of 1931.

[Report of entomological branch, Dominion of Canada], R. WEIR (*Canada Min. Agr. Rpt., 1931–32, pp. 166–193*).—The work with economic insects conducted during the year is reported upon.

Report of the chief entomologist for the year ending 31st December 1932, R. W. JACK (*Rhodesia Agr. Jour., 30 (1933), No. 7, pp. 564–584*).—This is a report on the occurrence of and work with economic insects of the year.

Entomological work, E. HARGREAVES (*Sierra Leone Dept. Agr. Ann. Rpt. 1932, pp. 17–20*).—A brief account is given of work with economic insects in Sierra Leone in 1932 (E.S.R., 69, p. 234).

[Entomological work in Tanganyika Territory, 1932] (*Tanganyika Ter. Dept. Agr. Ann. Rpt. 1932, pp. 68–75*).—The work of the year with economic insects (E.S.R., 69, p. 234) is reported upon by A. H. Ritchie (pp. 68–72), and W. V. Harris (pp. 73–75).

The history of economic entomology in Australia, R. VEITCH (*Queensland Agr. Jour., 40 (1933), No. 2, pp. 94–97*).—This is a brief account.

Dusting for pest and disease control in the United States and Canada, F. R. PETHERBRIDGE (*Jour. Min. Agr. [Gt. Brit.], 40 (1933), No. 3, pp. 209–215*).—A report of observations made during the course of an inspection of fruit districts in the United States and Canada in April, May, and June 1931.

Utilization of bacteria in combating insect enemies of cotton [trans. title], S. and S. S. METALNIKOV (*Compt. Rend. Soc. Biol. [Paris], 113 (1933), No. 18, pp. 169–172*).—In control work with cotton insects, particularly the pink bollworm, at Giza in Egypt, in which bacteria were used, the best results were obtained from the ingestion of *Bacterium ephestiae*. An average of 50 percent control was obtained in four small fields, the spores having been sprayed upon the plants.

The insect and allied fauna of cultivated mushrooms, I, II, M. D. AUSTIN (*Ent. Mo. Mag., 3. ser., 19 (1933), Nos. 217, pp. 16–19, fig. 1; 222, pp. 132–134*).—The more important enemies of mushrooms are noted.

The wheat field insect survey, 1933, J. S. HOUSER (*Ohio Sta. Bimo. Bul. 164 (1933), pp. 119–122, figs. 2*).—The annual wheat field insect survey for 1933 (E.S.R., 68, p. 70) indicates that the Hessian fly was much less abundant in Ohio than in the preceding year. The average for the entire State in all the fields surveyed in 1933 was 8.1 percent as compared with 35 percent in 1932. The average infestation of 75 fields surveyed in Ohio in 1933 by the U.S.D.A. Bureau of Entomology was 8 percent.

The relation of apple spray schedules to the arsenious oxide and lead residues, G. E. MARSHALL and O. W. FORD (*Indiana Sta. Bul. 381 (1933), pp. 19, figs. 2*).—The experiments reported have shown that both 1 and 2 percent oil sprays have a detrimental effect on Grimes and Jonathan varieties. "Other tests show that the varieties Delicious and Ben Davis are also subject to injury by summer oil sprays. Furthermore, observations in 1933 show that 1 and 2 percent summer oil sprays applied to the last three cover sprays decreased bloom on Grimes the following year 66 percent. Oil and oleic acid decreased bloom not over 50 percent. On Jonathan the effect was less marked than on Grimes. The nicotine tannate and barium fluosilicate treatments had no effect on bloom the following year."

It is considered doubtful whether any amount of rain would have reduced the arsenical residue on the standard lead arsenate plats to meet the U.S. tolerance of 0.01 grain of arsenious oxide per pound of fruit. Spreaders have proved unsatisfactory in codling moth control. The use of 1 percent summer oil alone or in combination with oleic acid or nicotine (1 to 1,600) has not given satisfactory results in either worm control or residue removal, although 1 percent summer oil with nicotine (1 to 1,200) has given good control.

"In plats which received lead arsenate for the first-brood sprays and lead arsenate, 2 percent summer oil, or 2 percent summer oil with oleic acid . . . for second-brood sprays, the average residue (on the four varieties used, Jonathan, Stayman, Grimes, and Winesap) per pound of apples was less at harvest than immediately after the last spray. When the residue per apple was considered the reverse was true, especially so when 2 percent summer oil and 10 percent oleic acid were used. The average residue both per pound of apple and per apple was less at harvest on 2 percent summer oil and 2 percent summer oil with oleic acid plats than on lead arsenate plats. The average residue both per apple and per pound of apple was less at harvest on 2 percent summer oil with oleic acid than on either the 2 percent summer oil or lead arsenate plats. The average residue increased less per apple and showed less residue per pound of fruit at harvest on plats in which oleic acid had been combined with summer oil for second-brood sprays."

Of all the sprays tested, lead arsenate for first brood and 2 percent summer oil with 10 percent of oleic acid for second brood proved to be the best sprays to use from the standpoint of residue removal by weathering, injury to the tree and fruit, and worm control. No fixed ratio seems to exist in the weathering off of lead and As_2O_3 on fruit.

The principal grape insects of Michigan, R. H. Pettit (*Michigan Sta. Spec. Bul. 239 (1933), pp. 18, figs. 13*).—A practical summary of information on the important insect enemies of the grape in Michigan, "written with the desirability of avoiding the use of lead arsenate in mind."

Protecting stored furs by fumigation, E. P. Collins (*Jour. Tech. Assoc. Fur Indus., 3 (1932), No. 2, pp. 39–48*).—A practical discussion presented as part of a symposium at a meeting of the Technical Association of the Fur Industry in March 1932.

Propylene dichloride mixture controls clothes-moths and carpet-beetles in rugs and over-stuffed furniture, E. I. McDaniel (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 13–15*).—The author recommends the use of propylene dichloride mixture for control of clothes moths, carpet beetles, and the cigarette beetle, which latter pest has extended its diet to include the tow filling of overstuffed furniture, thus becoming a first-class furniture pest. It is said that the damage can be checked by fumigation with propylene dichloride, 90 parts, mixed with 10 parts of carbon tetrachloride, applied with considerable pressure with a spray gun.

"After the furniture is treated it should be covered immediately with rugs, heavy quilts, or several thicknesses of paper in order to confine the fumes. Where the furniture is left covered for 48 hours, the results have been satisfactory. Roll the rugs in paper after they have been treated, and if possible leave them undisturbed for a period of 48 hours. Before spreading them on the floors, clean the underlying mats or, in case mats are not used, scrub the floors or go over them with floor wax in order to kill any larvae that might remain. It will be likewise worth while to inject propylene dichloride mixture back of mopboards and in any protected place where larvae may be hidden."

Progressive change in the insect population of forests since the early Tertiary, C. T. Brues (*Amer. Nat., 67 (1933), No. 712, pp. 385–406*).—This contribution is presented in connection with a list of 20 references to the literature.

Observations on the desert locust in east Africa from July 1928 to April 1929, C. B. Williams (*Ann. Appl. Biol., 20 (1933), No. 3, pp. 463–497, pl. 1, figs. 10*).—A report of observations made of *Schistocerca gregaria* Forsk. in east Africa in 1928–29, where two broods developed between May 1928 and April 1929. The chief natural enemies were *Stomatorrhina lunata* F., a dipterous parasite of the egg, and *Sphex aegyptiacum*, a predator on the adult locusts.

Notes on Utah Hemiptera, G. F. Knowlton (*Canad. Ent., 64 (1932), No. 7, pp. 166, 167; abs. in Utah Sta. Circ. 102 (1933), p. 7*).—This list of 18 species of Hemiptera includes several species not heretofore reported as occurring in Utah.

The bionomics and control of Dysdercus (Hemiptera) in the Sudan, F. G. S. Whitfield (*Bul. Ent. Res., 24 (1933), No. 2, pp. 301–313, pls. 4, figs. 3*).—This contribution deals with one of the most important pests of rain-grown cotton in the Sudan, the life history of *Dysdercus superstitiosus* F. and *D. fasciatus* Sign. being graphically illustrated in chart form.

Entomological contributions to the study of the sugar-cane froghopper, A. Pickles (*Trop. Agr. [Trinidad], 10 (1933), No. 8, pp. 222–233, figs. 4*).—A report is made of studies on the incidence of egg parasites of the sugarcane froghopper. The highest average figure for the whole area during the period studied appears to be in the neighborhood of 5 percent. The chief egg parasite is *Anagrus urichi* Pickles, other species apparently being of only occasional occurrence. The incidence of this parasite is affected by dry-season conditions; after a wet dry-season, the parasite becomes generally distributed and relatively abundant early in the year, but a severe dry-season delays its appearance in appreciable numbers very markedly. The parasite is definitely more abundant in host eggs laid in cane trash than in eggs laid in soil, a fact which militates against its efficiency in controlling the host. Evidence is given indicating that the syrphid fly *Salpingogaster nigra* Schiner is a significant factor in controlling froghoppers under cane field conditions. The most important natural control of the froghopper is the green muscardine fungus *Metarrhizium anisopliae*, and detailed evidence is given showing that this fungus can reduce a potentially large froghopper population below the level at which serious damage occurs.

Fiji disease of sugar-cane and its transmission, R. W. Mungomery and A. F. Bell (*Queensland Bur. Sugar Expt. Stas., Div. Path. Bul. 4 (1933), pp. 28, figs. 8*).—In preliminary trials conducted with mixed cultures of insects, transmission of the Fiji disease of sugar was obtained in cages in which the sugarcane leafhopper, *Aphis sacchari*, and *Trionymus sacchari* were common. A further trial in insect-proof cages, in which these insects were caged separately, demonstrated that the disease was transmitted by the sugarcane leafhopper.

Report on the infestation of cured tobacco in London by the cacao moth Ephestia elutella Hb., H. H. S. Bovingdon (*[Gt. Brit.] Empire Marketing Bd. [Pub.] 67 (1933), pp. 88, pls. [11]*).—This report describes the results of survey work carried on in London warehouses, experimental work showing the extent to which fire-cured and kiln-cured tobaccos are affected, and experimental work dealing with *E. elutella* in warehouses and other stores. The measures here recommended include low-temperature storage of tobacco as a means of sterilizing it, and, where this is not possible, fumigation of tobacco and of premises in which tobacco is stored. Following an introduction (pp. 9–14), survey work in the warehouses (pp. 14–34), experimental work—entomological (pp. 34–43), experiments bearing upon methods of control (pp. 44–62), the control of *E. elutella* (pp. 62–78), and miscellaneous matters (pp. 78–80) are presented. A bibliography of three pages, an appendix dealing with the effect of low temperatures on the cigarette beetle, and a glossary are included, as is a full-size colored plate of the moth.

The control of strawberry leaf roller on bearing plants, R. Hutson (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 7, 8*).—A series of control tests made during the past two seasons with the strawberry leaf roller, which has increased in importance on everbearing varieties as well as the regular-grown strawberries, resulted in the finding of a combination of nicotine sulfate 1 pt., summer oil emulsion 1 gal., and activated pyrethrum dust to be the most promising materials. It is pointed out that most of the effect from the oil-nicotine combination of spray is due to killing of the eggs. With the oil-nicotine combination it is necessary to use about three sprays, spaced approximately a week apart, from 85 to 90 percent control being thus obtained. With the activated pyrethrum dust applied by any method at the rate of about 50 lb. to the acre, a single application will control about 75 percent of the leaf rollers, even when protected by the rolled leaves. A second application 3 or 4 days later will result in almost complete control of the pest.

Notes on the natural control of Coleophora laricella, the larch casebearer, W. H. Thorpe (*Bul. Ent. Res., 24 (1933), No. 2, pp. 271–291, figs. 20*).—An account is given of the natural enemies of the larch casebearer, the larva of which has long been recognized as a very serious forest pest. Of these enemies the parasite *Angitia nana*, the most promising, is considered at some length. Systematic notes on the Chalcidoidea, by C. Ferrière, are given in an appendix (pp. 288–291).

The pecan shuckworm (Laspeyresia caryana (Fitch)), F. W. Walker (*Florida Sta. Bul. 258 (1933), pp. 18, figs. 4*).—The pecan shuck worm, which has been found in practically every pecan orchard in Florida and in nearly every pecan-producing State in the eastern part of the United States, was responsible for a loss of at least 25 percent of the crop in Florida in 1927. Its food consists of husks of the pecan and other species of hickory. It also feeds on husks of the black walnut, and in the early spring has sometimes been found feeding on the galls of *Phylloxera* on hickory and pecan. The attack results in a total destruction of young nuts by the earlier broods, poor filling of infested nuts, marring of nuts with sooty marks or scars from tunnels of larvae, and delayed maturity.

The incubation period of the egg is usually from 5 to 7 days. The larval period during the summer is from 19 to 32 days, and in winter from 110 to 150 days. In Florida there are four broods each year and sometimes five. Adults have been found in the field from February 18 to October 5. The larvae can be found every month in the year.

While attacked by a number of predacious and parasitic enemies, none of these is sufficiently numerous to reduce the pest to such an extent that artificial control is unnecessary. Heavy rains during the summer months destroy some by washing unhatched eggs from the nuts. It has been found that the damage caused can be materially reduced by plowing under the husks during the early part of March, the old husks being knocked from the trees and raked back from the trunks before plowing. The total destruction of all old husks by burning is considered by far the best method of controlling the shuck worm, but is feasible only where nuts have been harvested on sheets so that the refuse can be placed in piles. The cost of control measures is said to be very little compared with the value of nuts that can be saved. All bearing hickories in the vicinity of orchards should be cut down if possible, as they are a source of reinfestation.

Laboratory tests with various fumigants on codling-moth larvae, J. M. Ginsburg (*Jour. Agr. Res.* [*U.S.*], *46* (*1933*), *No. 12, pp. 1131–1136*).—A difficult problem met with by orchardists in New Jersey and other States by the rapid increase of codling moth infestation from year to year in the aging apple orchards led to a study by the New Jersey Experiment Stations of the possibility of fumigating apple trees in the dormant stage. The fumigants tested on the codling moth larvae at different temperatures under laboratory conditions included the following: "Liquid hydrocyanic acid, ethylene chlorohydrin, carbon bisulfide, ethyl acetate, ethylene oxide, diethylene oxide, and ethylene dichloride. The minimum dosages, calculated in cubic centimeter of liquid per 100 cu. ft. of space, required to kill 75 percent or more of larvae were determined.

"The results from tests on naked larvae show that ethylene chlorohydrin and hydrocyanic acid proved most toxic, the minimum dosages being 20 cc and 30 cc, respectively. Carbon bisulfide and ethyl acetate ranked very low in toxicity, the minimum dosages being 286 cc and 572 cc, respectively. Diethylene oxide, ethylene oxide, and ethylene dichloride were midway between the two extremes, with minimum dosages of 115, 143, and 215 cc, respectively. The tests on larvae in hibernacula show, in general, the same order of toxicity for the various fumigants as observed on naked larvae, with the exception that the minimum dosages were considerably larger. Low temperatures greatly decreased the percentage of kill obtained with both hydrocyanic acid and ethylene chlorohydrin."

Utilization of bacteriological methods in combating the pink bollworm of cotton (Gelechia gossypiella Saund.) [trans. title], S. and S. S. Metalnikov (*Coton et Cult. Coton.*, *8* (*1933*), *No. 1, pp. 1–13, figs. 2*).—A more detailed account than that noted on page 61, presented in connection with a list of 42 references to the literature.

The infestation of corn ears by the European corn borer, and cribbed corn as an auxiliary source of infestation. L. H. Patch (*U.S. Dept. Agr. Circ. 275* (*1933*), *pp. 8*).—Estimates were made of the population of the European corn borer in the ear corn harvested from fields having different densities of borer populations in the counties of northern Ohio from 1926 to 1929. The results indicate that "less than 1 percent of the total borer population hibernates in the ears harvested from fields that have populations as high as 2.7 borers per plant, and that less than 31 moths would emerge from the cribbed corn harvested from an acre in cornfields that have 50 percent of their plants infested by the corn borer and having population densities up to 1.4 borers per plant. The estimated number of moths per acre emerging from the cribbed corn harvested from fields 78 percent infested and 2.7 borers per plant is 72.8. Based upon the observations reported in this circular, a range of from 374 to 1,188 moths may emerge from an acre yield of ears from plants containing 6.4 to 20.3 borers per plant. The foregoing estimates may be reduced two thirds, or may be doubled, by seasonal fluctuations in the proportion of the total borer population per field contained in the ears placed in corncribs.

"The small numbers of moths emerging from stored ear corn is accounted for by the extensive migration of the borers from the ears before the harvest and by the high mortality of the hibernating borers in the cribbed corn."

Notes on the minimum and optimum luminosities causing the photic response of the rice borer moth, T. Kaburaki and T. Iwasa (*Imp. Acad. [Japan], Proc., 9 (1933), No. 3, pp. 140–142*).—It is concluded that luminosities exercising a superior attraction for the Asiatic rice borer range from 0.0131 to 0.0920 lux. This range of luminosities appears not to vary decidedly in different sexes.

On the biology of Cacoecia crataegana Hub. (Lepidoptera: Tortricidae) on fruit trees in the Wisbech area, G. L. Hey and I. Thomas (*Ann. Appl. Biol., 20 (1933), No. 3, pp. 439–462, pls. 2, figs. 13*).—A report is made of observations of the life history and habits of *C. crataegana* in the Wisbech area, England, where it attacks fruit trees. Work with control measures and with parasites, including the biology of the egg parasite *Trichogramma evanescens* Westw., follows. A list is given of 25 references to the literature.

Corn earworm studies, L. P. Ditman and E. N. Cory (*Maryland Sta. Bul. 348 (1933), pp. 525–543, figs. 6*).—In this work the authors report the results of work conducted in 1932 and briefly refer to earlier studies, followed by observations of husk characteristics and their relation to injury by the corn ear worm, results of preliminary experiments on the reaction of the moths to lights, studies on the nutrition of the moths, the repellency of several materials, and the attractiveness of sweet baits in the field. A general discussion of the control of this pest is given with present recommendations.

It is pointed out that in view of the fact that no direct control methods for the pest have ever been developed and since the low intrinsic value of canning corn limits the cost of any direct control measures that might be developed, any indirect measures that assist in reducing injuries with little or no cost become of considerable importance. Such indirect measures as fall plowing, early planting, and the selection of varieties with qualities that resist ear worm injury, while not eliminating entirely the devastations by this insect, should reduce losses to a considerable extent. The recommendation of these practices has been made for a number of years, but until other methods are developed, they are all that can be done economically in combating this insect as a pest of sweet corn.

Life history of the common mosquito Culex pipiens: The human evolution and the biological adaptations of the mosquito [trans. title], E. Roubaud (*Ann. Sci. Nat., Zool., 10. ser., 16 (1933), No. 1, pp. 168, pls. 8, figs. 32*).—This is an extended account of the life history and bionomics of *C. pipiens* L., presented in connection with a five-page list of references to the literature.

Gall midges (Cecidomyidae) as enemies of mites, H. F. Barnes (*Bul. Ent. Res., 24 (1933), No. 2, pp. 215–228*).—This further contribution on the subject (E.S.R., 64, p. 365) includes an account of gall midges whose larvae attack free-living mites; those whose larvae are known to, or probably, attack gall-inhabiting mites; and those whose larvae may feed on mites. The contribution concludes with a list of plants on which mites are attacked by gall midge larvae, arranged (1) by free-living mites and (2) by gall-inhabiting mites.

The species of blowflies in the Adelaide district of South Australia and their seasonal occurrence, J. Davidson (*Jour. Dept. Agr. So. Aust., 36 (1933), No. 10, pp. 1148–1153, figs. 2*).—This report includes the results obtained in a series of continuous trappings conducted with a view to determining the important species prevalent in the Adelaide district of South Australia and their relative abundance throughout the year.

A cambium miner of basket willows (Agromyzidae) and its inquiline gall midge (Cecidomyiidae), H. F. BARNES (*Ann. Appl. Biol., 20 (1933), No. 3, pp. 498–519, pls. 2, figs. 12*).—This contribution deals with the morphology of the several stages of the agromyzid *Dizygomyza barnesi* n.sp., followed by a report of observations of its life history and bionomics.

"There is only one brood a year and the larvae mine in the cambium of different species of *Salix*. Pupation takes place in the soil. While *S. viminalis* is attacked most commonly, *S. triandra*, *S. purpurea*, *S. viminalis* × *purpurea*, and *S. triandra* × *viminalis* occasionally suffer. In addition the larvae can live on *S. caerulea*. The damage caused by the larvae is considerable. The braconids *Symphia ringens* Halid. and *S. hians* Nees are recorded as primary parasites. Two gall midges are described, the larvae of one living as inquilines in the burrows of the *Dizygomyza* larvae. The bionomics of this species are described."

A study of the spinach leaf miner on the beet in Belgium in 1932 [trans. title], L. DECOUX and G. ROLAND (*Inst. Belge Amélior. Betterave Pubs., No. 4 (1933), pp. 83–142, figs. 25*).—This is a report of a study of the morphology and biology of the spinach leaf miner as it occurred on beets in Belgium in 1932 and of its economic importance and natural and artificial means of control.

Typhus fever: Experimental transmission of endemic typhus fever of the United States by Xenopsylla astia, W. G. WORKMAN (*Pub. Health Rpts.* [*U.S.*], *48 (1933), No. 27, pp. 795–797*).—The author has shown the rat flea *X. astia* to be capable of becoming infected with endemic typhus fever virus. The transmission of this virus from an infected white rat to a noninfected white rat was accomplished by *X. astia*. Crushed infected fleas rubbed upon the abraded skin produced endemic typhus in the guinea pig. Feces collected from infected fleas were shown to contain the virus of endemic typhus.

Some wood borers attacking the trunks and limbs of deciduous trees and shrubs, E. I. MCDANIEL (*Michigan Sta. Spec. Bul. 238 (1933), pp. 37, figs. 32*).—Popular accounts are given of the more important borer enemies of the trunk and limbs of deciduous trees and shrubs in Michigan.

A large longicorn borer in the base of trees of Schima noronhae Reinw. (Trachylophus approximator Gah.) [trans. title], L. G. E. KALSHOVEN (*Tectona* (*Boschbouwk. Tijdschr.*), *26 (1933), No. 6, pp. 498–507, pls. 2; Eng. abs., pp. 506, 507*).—This is an account of the cerambycid *T. approximator*, which was attacking *S. noronhae* in young forest plantations about 140 m above sea level.

On the broad bean weevil introduced in Japan, A. KAMITO (*Imp. Acad.* [*Japan*], *Proc., 9 (1933), No. 3, pp. 137–139*).—The broadbean was first discovered in Kumamoto Prefecture, Japan, in 1925 to be attacked by the broadbean weevil.

Some observations on the life history and parasites of Hypera rumicis (L.) (Coleoptera: Curculionidae), T. R. CHAMBERLIN (*Ent. Soc. Wash. Proc., 35 (1933), No. 6, pp. 101–109*).—This contribution deals with a species closely related to the alfalfa weevil which has frequently been taken in alfalfa fields containing dock near Redmond, Oreg. Five species of parasites have been reared from it, two of which (*Bathyplectes exigua* (Grav.) and *Dibrachoides dynastes* (Foerst.)) have been reared previously from the lesser clover leaf weevil in the Pacific Northwest, and *D. dynastes* has been reared from the alfalfa weevil. A list is given of 15 references to the literature.

Plant poisoning of brood of bees, C. E. BURNSIDE and R. E. FOSTER (*Gleanings Bee Cult., 61 (1933), No. 8, pp. 470–473, fig. 1*).—A serious disturbance of bees observed in western Florida in 1932 which differed from any of the known brood diseases appears to have been due to plant poisoning, suspicion having been directed to shrubs of the genus *Hypericum*. Reports from Florida beekeepers and observations by the junior author indicated that the disturbance had existed continuously for at least three years, and had killed more than 50 percent of the colonies in many apiaries in Madison, Taylor, and Jefferson Counties. The losses are reported to have been severe only during seasons of prolonged drought. Out of 10 colonies with sick and dead brood which were moved from infected to uninfected territory, 9 recovered completely in from 1 to 3 months.

On the method of mass-production of Trichogramma, M. Shibuya (*Imp. Acad. [Japan], Proc., 9 (1933), No. 3, pp. 130–133, fig. 1*).—A brief account is given of the method employed in the mass production of the *Trichogramma* egg parasite to combat the Asiatic rice borer by rearing it upon the fig moth. A daily maximum production of 500,000 parasites at the Shizuoka (Japan) Agricultural Experiment Station is reported.

Miscellaneous notes and descriptions of chalcidoid parasites (Hymenoptera), H. L. Dozier (*Ent. Soc. Wash. Proc., 35 (1933), No. 6, pp. 85–100, fig. 1*).—Ten new chalcidoid species are described and records given of 20 other species, all reared by the author, for the most part from Coccidae and Aleyrodidae.

A successful parasite introduction into British Columbia, R. Glendenning (*Canad. Ent., 65 (1933), No. 8, pp. 169–171*).—The introduction of a chalcid fly, *Blastothrix sericea* Dalm., into British Columbia in 1928 to combat the lecanium scale *Eulecanium coryli* (L.) has resulted in the practical control of the pest in North Vancouver, where the original liberations were made, parasitism having ranged from 40 to 95 percent in the autumn of 1931. Parasitism over the entire scale infestation is said to have ranged from 10 to 80 percent. This scale, which was accidentally introduced from Europe about 1913, had by 1925 become one of the most destructive insects in the coast region of British Columbia, attacking a great variety of hosts, the chief of which, in order of preference, are alder, horsechestnut, maples of several species, hawthorn, mountain-ash, laurel, elm, and garden roses, and a few scales were often found on *Rubus*, *Populus*, *Betula*, and *Salix*.

It is pointed out that since no alternate host of the parasite has been found, so far as known, the future of this parasite in Canada will be watched with interest.

The citrus gall wasp (Eurytoma fellis Gir.), N. S. Noble (*Agr. Gaz. N.S. Wales, 44 (1933), No. 6, pp. 465–469, fig. 1*).—A brief account is given of the gall wasp *E. fellis*, which is becoming very abundant in commercial lemon orchards in the Grafton district of New South Wales.

On the biology of the plum sawfly Hoplocampa flava L., with notes on control experiments, F. R. Petherbridge, I. Thomas, and G. L. Hey (*Ann. Appl. Biol., 20 (1933), No. 3, pp. 429–438, pl. 1*).—In this report of studies reasons are given why all records of plum sawfly damage in England referred to *H. fulvicornis* should be referred to *H. flava*. Observations showing the variation in intensity of attack during 1925–32 are reported. Control experiments aimed at destruction of the larvae were promising in 1929, but yielded no control in 1932.

Hereditary transmission of infections through arthropods, E. H. Hinman (*Amer. Jour. Trop. Med., 13 (1933), No. 4, pp. 415–423*).—A brief résumé is given of the literature on the hereditary transmission of human infections by arthropods, presented in connection with a list of 27 references to the literature.

Preliminary trials with a combined insecticide and fungicide, H. R. Briton-Jones (*Trop. Agr. [Trinidad], 10 (1933), No. 3, pp. 80–84*).—A report of work conducted with Sulphemusol on fire ants on grapefruit, oranges, and mangoes; purple scale and Florida red scale on grapefruit and oranges; thrips on cacao; weevils (*Calandra* spp. and *Pachymerus quadrimaculatus*) in seed grain; a caterpillar (*Phyllanthus distichus*) on cherry; fall army worm; and mealybugs.

Rocky Mountain spotted fever: Potentialities of tick transmission in relation to geographical occurrence in the United States, R. R. Parker, C. B. Philip, and W. L. Jellison (*Amer. Jour. Trop. Med., 13 (1933), No. 4, pp. 341–379, pl. 1, figs. 10*).—This contribution deals with the transmission of Rocky Mountain spotted fever by eight species of North American ticks, with particular reference to their importance in the United States as known or possible carriers of the virus both in nature and to man. Pertinent information relative to the known carriers, *Dermacentor andersoni* Stiles, the American dog tick, and the rabbit tick, is briefly summarized. As regards the American dog tick, data of generation to generation passage of the virus are reported for the first time. As concerns the rabbit tick, the suggestion is made that certain ground-frequenting, migratory bird hosts, such as the meadow lark may, through transportation of this tick, serve as agents in the extensive distribution of the virus.

The contribution is presented in connection with a list of 31 references to the literature. A plate, with maps which show the regional occurrence in the United States of the ticks that are actual or potential transmitting agents of spotted fever, namely, *D. andersoni*, the American dog tick, the Pacific coast tick, *D. parumapertus marginatus* Banks, the Lone Star tick, *Amblyomma cajennense* (Fabr.), and the brown dog tick, is included. It is pointed out that the rabbit tick occurs over the entire United States.

Further studies on the relationship of the viruses of Rocky Mountain spotted fever and São Paulo exanthematic typhus, R. R. Parker and G. E. Davis (*Pub. Health Rpts. [U.S.], 48 (1933), No. 29, pp. 839–843, figs. 3*).—In continuation of the studies previously noted (E.S.R., 69, p. 869), the authors report upon experiments conducted in which a strain of the São Paulo virus was used that had been established in guinea pigs from infected *Amblyomma cajennense* ticks. These data, together with the earlier findings, indicate that São Paulo exanthematic typhus and Rocky Mountain spotted fever are immunologically identical.

Relapsing fever in Texas.—I, The identity of the spirochete, H. A. Kemp, W. H. Moursund, and H. E. Wright (*Amer. Jour. Trop. Med., 13 (1933), No. 4, pp. 425–435*).—The spirochete of the tick-transmitted relapsing fever in Texas has been found to be identical with *Borrelia novyi* and does not represent a new species.

"Scalyleg" in wild birds, W. E. Whitehead (*Sci. Agr., 13 (1933), No. 12, p. 753, fig. 1*).—A scaly-leg mite, *Cnemidocoptes fossor* (Ehlers), is reported as having been found infesting the foot of the rusty grackle *Euphagus carolinus* L. in Canada. Reference is also made to a record of the infestation of a willow grouse in the vicinity of Victoria, B.C., by the scaly-leg mite (*C. mutans* Robin).

Notes on a mite infesting a flea, W. E. Whitehead (*Sci. Agr., 13 (1933), No. 12, pp. 751, 752, figs. 2*).—The author has observed the mite *Tyrophagus putrescentiae* (Schrank 1871) to be transported by the flea *Ceratophyllus saundersi* Jordan, recently described as a new species. Only immature mites are associated with fleas. They wedge themselves beneath the overlapping tergites of the fleas, as well as attaching themselves by means of ventral suckers. Very few adults of such mites are known; they are believed to be free-living.

Ciliates from Bos indicus Linn., I–III, C. A. Kofoid and R. F. MacLennan (*Calif. Univ. Pubs. Zool., 33 (1930), No. 22, pp. 471–544, pls. 4, figs. 17; 37 (1932), No. 5, pp. 53–152, pls. 4, figs. 10; 39 (1933), No. 1, pp.* [*3*]+*34, pl. 1, figs. 5*).—The first contribution on the ciliates of the humped Indian ox deals with the genus *Entodinium* of Stein, 15 species of which are described as new and 5 old ones redescribed. The second contribution consists of a revision of *Diplodinium* of Schuberg, which is restricted, and several genera erected, 21 species being recognized from *B. indicus,* 12 of which are described as new. The third contribution deals with *Epidinium* of Crawley, *Epiplastron* n.g., and *Ophryoscolex* of Stein. Lists of references to the literature are included.

ANIMAL PRODUCTION

Growth and development with special reference to domestic animals, XXVII–XXXI (*Missouri Sta. Res. Buls. 189 (1933), pp. 68, figs. 11; 190 (1933), pp. 19, figs. 6; 191 (1933), pp. 18, figs. 6; 192 (1933), pp. 28, figs. 11; 193 (1933), pp. 48, figs. 13*).—This series of studies (E.S.R., 69, p. 407) is continued.

XXVII. *Endogenous urinary nitrogen and total creatinine excretion in rats as functions of dietary protein level, time on N-free diets, age, body weight, and basal metabolism,* U. S. Ashworth and S. Brody.—Data are presented for the nitrogen, total creatinine, and energy metabolism of rats between the ages of 21 days and 2 years. The rats were fed in pairs on diets of high and low protein levels. For securing the minimum nitrogen excretion, the animals were kept on practically nitrogen-free diets for periods up to 100 days in length.

The average total creatinine coefficient was 15.1 mg per kilogram of body weight, and this value was practically independent of age and of the protein level of the diet. The total urinary nitrogen coefficient was more of a function of the time a rat was kept in a state of specific nitrogen inanition than it was of age. In most cases this minimum nitrogen coefficient was not reached until about the fifteenth day on the nitrogen-free diet, although in several cases minimum levels of from 90 to 100 mg of urinary nitrogen per kilogram of body weight were attained during the first 7 days. The average of the ratio of creatinine nitrogen to total urinary endogenous nitrogen was approximately 11 percent, but as high as 15 percent was sometimes reached. Since the total creatinine coefficient was practically constant for all weights, the ratio of basal metabolism to creatinine followed approximately the same course as the ratio of basal metabolism to body weight.

The ratio of basal metabolism to total creatinine nitrogen declined with increasing weight at approximately the same rate as the ratio of Calories to body weight. The average numerical values of this ratio ranged from 13 at 80 g of body weight to 6 at 300 g of weight. The Calories per milligram of urinary endogenous nitrogen ratio approached 1.5 as a limit for young rats with high basal metabolism, but with heavier animals the limit was nearer to 0.8 Calorie. The lower creatinine coefficients and lower endogenous nitrogen coefficients indicated a greater proportion of fatty tissue in rats on high protein diets.

XXVIII. *Decline of endogenous nitrogen excretion per unit weight with increasing weight in growing rats, and its relation to the decline in basal metabolism. Decline in live weight, nitrogen and energy metabolism with the advance of the period of nitrogen starvation and the influence of live weight and of preceding level of protein intake on these declines and on the survival periods,* U. S. Ashworth and S. Brody.—Rats ranging in age from 20 to about 600 days were placed on nitrogen-free but otherwise complete diets and were kept on the diets until death while measuring the nitrogen and energy metabolism.

The total creatinine nitrogen coefficient was constant for the ages studied, but the total endogenous urinary nitrogen coefficient declined with increasing live weight as did also the basal energy metabolism coefficient. The ratio of basal energy metabolism to basal nitrogen excretion was constant, but the ratio of creatinine nitrogen to endogenous urinary nitrogen increased with the increase in the size of the animals. These results suggested that the intensity of basal energy and of basal nitrogen metabolism was limited by the "active protoplasmic mass" in the body.

The energy metabolism was reduced by a long period on a nitrogen-free diet to the same minimum level as occurred during prolonged periods of absolute starvation. This level was 400 Calories per square meter per day. The level of protein intake prior to the nitrogen starvation period had a marked effect on the time required to reach the endogenous level of nitrogen excretion. While live weight was not an influencing factor in this respect, there were great individual variations as shown by the fact that animals taken from the regular stock diet required from 4 to 26 days to reach this level. On the nitrogen-free diet the fecal nitrogen was practically a constant percentage of the total nitrogen excretion, showing a slight tendency to increase as the period on the ration increased. The ratio of fecal nitrogen to food intake increased markedly as the period on the nitrogen-free diet advanced.

Rats survived up to six months on the nitrogen-free diet, depending on the initial live weight and age, losing approximately 60 percent of their live weight during this time. This was approximately the same loss as occurred during periods of absolute fast. The time curve of live weight on the nitrogen-free diet showed staircase phenomena indicating the successive use of tissues of successively greater stability. This same phenomena was also exhibited in the time curves of nitrogen excretion.

XXIX. *Age curves of a creatinine and urinary nitrogen coefficients in dairy cattle, and their relations to energy metabolism*, U. S. Ashworth and S. Brody.—Urine was collected from 6 Jersey and 4 Holstein females between the ages of 7 and 40 months and was analyzed by standard methods.

It was found that the average preformed creatinine coefficient was 9.5, and it remained practically constant throughout the age interval. The fluctuations in this coefficient were caused by the relative degrees of fatness of individuals. The average creatinine nitrogen coefficient was 7.6, and it followed the same course as the above coefficient. The total urinary-nitrogen coefficient varied from 150 to 350, largely paralleling the nitrogen intake. The lowest value of this coefficient was observed shortly before calving. The percentage ratio of preformed creatinine nitrogen to total urinary nitrogen ranged from 2 to 6.5, averaging 3.6. The percentage ratio of total creatinine nitrogen to urinary nitrogen ranged from 6.3 to 6.8. It was found that 79 percent of the urinary nitrogen was made up of urea and ammonia. The ratio of Calories to milligrams of preformed creatinine nitrogen declined steadily from 3.3 at 6 months to 1.4 at 40 months. The ratio of Calories of "resting" energy metabolism to milligrams of urinary nitrogen excreted averaged 0.09.

The results show that the maintenance requirements for feed energy per unit live weight declined with increased live weight, while the maintenance requirements of feed protein per unit live weight may remain roughly constant for normally fed animals. Dairy cattle fed according to good dairy practice may receive too much protein in their diet.

XXX. *The partition of digestible nitrogen intake between growth, milk secretion, and urinary excretion in growing dairy cattle*, S. Brody and A. C. Ragsdale.—Data are presented on the partition of digestible nitrogen between growth, milk secretion, and urinary nitrogen excretion; on the course of decline of the apparent efficiency of growth from birth to 29 months of age; on the heat increment of feeding; on the relation between the age curves of feed consumption and heat production; on the feed consumption and growth in body weight; on the nutritive ratios of the diet; and on the percentage of Calories of the diet in the form of protein for growing dairy heifers between the ages of from 10 to 37 months.

After 10 months of age, under the feed conditions of this experiment, from 45 to 92 percent of the digestible dietary nitrogen was excreted in the urine. The higher value was obtained between the ages of 12 and 20 months and the lower value during the last month of pregnancy and during the flush of lactation. When fed according to good dairy practice, the intake of digestible crude protein ranged from 0.14 to 0.47 lb. and the intake of total digestible nutrients from 1 to 2 lb. per 100 lb. live weight daily. When expressed in the form of ratios of unit live weight gained to unit weight of food consumption, the apparent efficiency of growth with respect to digestible nitrogen ranged from 23 during the first month to 4 during the twenty-fifth month, and with respect to total digestible nutrients during the same period from 0.8 to 0.1. Data are also presented for the ratios of live weight gained to feed consumption less the estimated feed used for maintenance. The results indicated that calves between the ages of from 3 to 9 months were overfed on nitrogen and relatively underfed on energy. It is suggested that the protein content of the grain fed during this period be reduced and that an inexpensive oil be added to the skim milk fed to compensate for the butterfat removed.

XXXI. *Influence of the plane of nutrition on the utilizability of feeding stuffs. Review of literature and graphic analyses of published data on the net-energy and specific dynamic action problems*, S. Brody and R. C. Procter.—Graphical and mathematical analyses were made of the data on the influence of the plane of nutrition on the net energy values of feeding stuffs fed to steers and rabbits.

The analyses indicated that the net energy value of a feeding stuff Q_n, varies with the gross energy, Q_o, intake in accord with the equation $Q_n = A\ (1 - e^{-kQ_o})$, in which A is the maximum energy intake, e the base of the natural system of logarithms, and k the relative decline in the successive increments of Q_n with increasing equal increments of Q_o. Part of the decline was due to declining digestibility and metabolizability, but was primarily due to increasing "specific dynamic action" with increasing planes of nutrition. The above equation represents the relationship for an animal of given size. In order to eliminate size as an influencing factor, the value of A in the above equation would have to be divided by an equalizing factor, such as weight, area, or weight raised to some fractional power or the ratios of net energy, Q_n, to digestible energy, Q_d, would represent functions of the planes of nutrition, Q_p, when steer and rabbit data nearly coincide according to the equation $Q_n / Q_d = Ae^{-kQ_p} + 54$; or the ratios of given net energies to net energy at maintenance would be represented as functions of the planes of nutrition when the steer and rabbit data completely coincided.

An analysis of the net energy problem in cattle and rabbits led to the following conclusions: (1) The digestibility of typical rations for such animals was very low, about 28 percent of the gross ingested energy being lost in the form of feces and this loss increasing with an increase in the plane of nutrition; (2) methane losses averaged about 9 percent of the gross energy; (3) the energy loss in the urine averaged about 5 percent of the gross energy; (4) the range in energy losses due to specific dynamic action vary from about 3 percent of the gross energy at approximately one half maintenance to about 20 percent at maximum feed intake; and (5) the net energy per unit ration intake declined with increasing plane of nutrition due to the increase in specific dynamic action.

Analyses of commercial feeding stuffs and registrations for 1933, C. S. Cathcart (*New Jersey Stas. Bul. 554* (*1933*), *pp. 56*).—Analyses are reported for protein, fat, and fiber of 1,368 samples of commercial feeding stuffs sold in New Jersey during the year 1932, including a list of ingredients found microscopically (E.S.R., 68, p. 76).

Digestion and mineral balance trials on range cattle with native New Mexico range hay, cottonseed meal, and mineral supplements, W. E. Watkins (*New Mexico Sta. Bul. 212* (*1933*), *pp. 32*).—This study was undertaken to determine whether or not there was a deficiency of calcium and phosphorus in some of the range grasses in the vicinity of the station and to learn what minerals would correct the deficiency most efficiently if it did exist.

The range hay used had a calcium and phosphorus content of 0.26 and 0.21 percent, respectively. Cottonseed meal proved to be very efficient for furnishing both protein and phosphorus. Steers receiving 0.75 lb. of cottonseed meal and range grass hay gained 0.3 lb. more per head daily than the control group on hay and salt. When steers received a total of 14.7 g of phosphorus daily from both feed and disodium phosphate, positive phosphorus balances resulted. The greater solubility of the disodium phosphate appeared to make it superior to bone meal as a mineral supplement. A ration of range grass hay and salt supplied only 11.6 g of calcium and 8.5 g of phosphorus daily per steer, From results of this and previous studies (E.S.R., 65, p. 760), it was found that in the case of a growing steer a positive nitrogen balance was usually accompanied by a daily gain of 0.5 lb. per head.

The digestion coefficients of New Mexico range grass hay corresponded closely with the coefficients usually obtained for grasses of this character. On an air-dry basis the hay and cottonseed meal had a gross energy value of 4,227.8 and 5,111.4 calories, respectively, per gram. Black grama grass contained 4,326.4 calories of gross energy per gram.

During the metabolism tests abnormally small amounts of the meal and salt mixture were consumed, making it impossible to obtain comparative results. It was found that much less salt was consumed when calcium and phosphorus were fed with the salt. The favorable balances of calcium, phosphorus, and nitrogen during the last digestion trials were attributed to the increased age of the animals, requiring less nutrients for growth, or to the fact that the animals had become accustomed to the plane of nutrition and made better use of the nutrients fed.

The assimilations of calcium and phosphorus from different mineral compounds and their effect on range cattle, J. L. Lantow (*New Mexico Sta. Bul. 214* (*1933*), *pp. 30*, *figs. 10*).—Continuing the study of supplemental feeding of range cattle (E.S.R., 57, p. 564), this investigation was planned to determine the effect upon cattle of supplementing range forage with calcium and phosphorus. Hereford heifers and cows were divided into three groups of 25 head each and were placed on the experimental range. The supplements fed in the respective lots were salt, salt and bone meal, and salt and disodium phosphate. The study covered a period of more than two years.

While no animals on the experimental range have ever shown a mineral deficiency, the use of calcium and phosphorus proved to be beneficial and economical. A supplement containing both elements was more effective than one in which calcium was lacking. Phosphorus was assimilated from compounds other than calcium phosphates. The use of minerals did not replace the benefits derived from the protein of cottonseed cake when the latter was used as a winter supplement. Cattle having access to bone meal, monocalcium, monosodium, or disodium phosphate consumed considerably less salt than those receiving salt alone. There was a close correlation between feed and mineral consumption, but none with the varying calcium and phosphorus contents of forages. A pound of cottonseed cake furnished as much phosphorus but somewhat less calcium than was consumed when monocalcium phosphate was fed free choice.

In most sections of the State the feeding of calcium phosphate was as important for supplementing the range as the salt. Heifers having their first calves had a lower death rate, fewer difficult calvings, and stronger calves when they had access to a phosphorus or a calcium and phosphorus supplement than when receiving salt alone. A deficiency of calcium and phosphorus retarded growth, maturity, and milk production.

Steer fattening rations built largely around ground corn fodder and silage with cottonseed meal and molasses as the added concentrates, J. L. Lantow (*New Mexico Sta. Bul. 211* (*1933*), *pp. 8, figs. 2*).—A series of two feeding tests was conducted with yearling steers to determine the ration best suited to fattening cattle in the irrigated sections of New Mexico. The feeds used were fed in the following proportions in the respective lots: Cottonseed meal 3.5, cane molasses 3, and ground corn fodder 10.5 lb.; cottonseed meal 3, cane molasses 3, ground corn fodder 7, plus 4 lb. of alfalfa hay per head per day; and cottonseed meal 4.5, corn silage 25, plus 4 lb. of alfalfa hay. The average daily gains in the respective lots for the two tests were 2.3, 2.3, and 2.5 lb. per head.

While all three rations proved to be satisfactory so far as gains were concerned, the ration in lot 3 seemed to be the most practical. The silage lot showed better condition and finish than the fodder lots and was ready for market about two weeks earlier. It was also easier to keep the steers in this lot on feed than it was in the other lots, and the shrinkage was no greater.

Protein supplements and oats in cattle-fattening rations, A. D. Weber (*Producer*, *15* (*1933*), *No. 1*, *p. 7*).—The value of different protein supplements when fed with home-grown feeds to fattening cattle was studied during a series of three experiments at the Kansas Experiment Station. Seven lots of ten calves each were fed a basal ration of shelled corn, corn silage, and alfalfa hay. In addition the respective lots received cottonseed meal; lineseed meal; corn gluten meal; cottonseed meal and linseed meal equal parts; cottonseed meal and corn gluten meal equal parts; linseed meal and corn gluten meal equal parts; and cottonseed meal, linseed meal, and corn gluten meal equal parts. The calves fed linseed meal as all or part of their protein supplement ate more corn and made larger gains than those receiving the other supplements. Corn gluten meal was not so palatable as the other supplements when fed alone. On the basis of returns per steer the supplements ranked in the following order according to lots: 4, 6, 7, 2, 5, 3, and 1.

A basal ration of corn silage, cottonseed meal, and alfalfa hay was fed to two groups of calves during a 200-day feeding period. One lot received shelled corn and the other lot whole oats. Both grains were hand-fed the first 56 days and self-fed the remainder of the period. For the first 84 days the calves fed oats made as large gains and appeared to fatten as well as those fed corn. During the remainder of the test the gains were practically the same, but the oat-fed calves grew more than those fed corn. While oats could be used to good advantage during the early part of the feeding period, corn was a more valuable fattening feed.

Histological differences in the muscles of full, half and rough fed steers, D. D. Robertson and D. D. Baker (*Missouri Sta. Res. Bul. 200* (*1933*), *pp. 11, fig. 1*).—Samples of meat were taken from yearling steers that had been full-fed for 196 days on shelled corn, cottonseed meal, legume hay, and corn silage; or on a similar ration except that the grain was limited to one half the amount allowed in the first lot; or from a lot on a ration of legume hay and corn silage. The samples were fixed in various fluids for histological examination. The origin of the samples was from the midportion of the gracilis, the short head of the triceps, and the longissimus dorsi at the level of the twelfth rib.

The greatest diameter of muscle fibers was found in animals that had been full-fed and the smallest diameter in animals on roughage. Glycogen was found in small quantities in the fresh muscle fibers of all animals, but could not be identified in refrigerated meat. True fats were abundant in the connective tissue of the muscles of the full-fed cattle, but only traces were found in the muscles of the roughage-fed steers and could not be identified in the muscle fiber itself. Cold storage of short duration apparently had little effect upon the fats.

Methods of utilizing the corn crop for fattening steers, G. A. Branaman and R. S. Hudson (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 17–19*).—In this test three lots of 10 steers each, averaging about 741 lb. per head, were fed for 155 days on a basal ration of cottonseed meal and alfalfa hay. One lot was fed corn silage, another lot shock corn, and the third lot ground shock corn. The average daily gains in the respective lots were 1.7, 1.6, and 1.7 lb. per head.

When silage was fed the least acreage of corn per steer was required, while the most per steer was needed in the shock corn lot. When fed in the form of silage 45 percent more beef and pork were produced per acre of corn than when fed in the form of shock corn and 25 percent more than when fed in the form of ground shock corn. The shock corn fed cattle were fattest and valued, graded, and dressed highest, while the reverse was true of the cattle fed ground shock corn. Because fewer acres were required, silage gave the greatest return per acre and per bushel of corn fed when no labor or machinery charges were made, while ground shock corn gave the lowest return. Shock corn required the least number of man and horse labor hours per acre.

Fattening yearling heifers on alfalfa pasture, M. L. Baker (*Nebraska Sta. Bul. 281 (1933), pp. 7, fig. 1*).—During each of three summers two lots of heifers, averaging approximately 456 lb. per head, were brought to a full feed of corn and alfalfa as rapidly as possible. Lot 1 was then put on alfalfa pasture and continued on a full feed of corn, while lot 2 was continued on a full feed of corn and alfalfa hay in dry lot. After being on pasture for from 112 to 120 days, lot 1 was placed in dry lot and fed corn and alfalfa for from 20 to 28 days.

The heifers in lot 1 made slightly larger gains while on pasture and slightly smaller gains while in dry lot than those in lot 2. The heifers in lot 1 consumed an average of 36.5 bu. of corn during the feeding period. While on pasture it was estimated that they consumed the equivalent of 926 lb. of alfalfa hay and during the finishing period 126 lb. of hay. The lot 2 heifers ate 37.8 bu. of corn and 826 lb. of alfalfa hay per head. Lot 1 required 29 lb. less corn but 49 lb. more hay per 100 lb. of gain. A ton of alfalfa hay or its equivalent replaced 0.8 of a ton of alfalfa hay and from 3.5 to 4 bu. of corn in the production of gains. Both lots of heifers had approximately the same degree of finish. Pasturing did not appear to injure the stand of alfalfa, and no cases of bloating occurred.

Returns per acre in cattle feeding, V, P. Gerlaugh and H. W. Rogers (*Ohio Sta. Bimo. Bul. 164 (1933), pp. 129, 130*).—Continuing this study (E.S.R., 67, p. 590), two lots of 16 steers each, averaging approximately 631 lb. per head, were fed for 183 days. Lot 1 received a full feed of corn silage, a protein supplement made up of equal parts of cottonseed meal and whole soybeans, and mixed timothy and clover hay. Lot 2 received half as much silage as lot 1, all the ground oats they would consume, and mixed hay. The average daily gains in the respective lots were 1.9 and 2.2 lb. per head. These results showed that oats can be used as a fairly satisfactory substitute for shelled corn and a protein supplement. Corn in the form of silage produced a greater amount of gain on the cattle per acre than did the combination of silage and oats.

Beef production in Florida, A. L. Shealy (*Florida Sta. Bul. 260 (1933), pp. 54, figs. 26*).—The production of beef cattle under Florida conditions is discussed in this bulletin. The breeding, management, feeding, and marketing of beef cattle are described, together with the symptoms of some of the more common diseases and their treatment.

Determination of the digestibility and nutritive value of Niger oil cakes [trans. title], J. Koukl and B. Cuřín (*Sborn. Výzkumn. Úst. Zeměděl. Repub. Českoslov. (Rec. Trav. Insts. Rech. Agron. Répub. Tchécoslov.), 91 (1932), pp. 29, figs. 5; Fr., Ger., Eng. abs., pp. 19–21, 23–25, 27–29*).—The Institute for Animal Biotechnique at the State Agricultural Research Institutes for Animal Production in Praha (Prague), Czechoslovakia, undertook a study of the digestible nutrients of Niger oil cakes with sheep. It was found that the average coefficients of digestibility were for organic matter, 73.4 percent; protein, 95.9; nitrogen-free extract, 67.6; fat, 92.9; and fiber, 32.8 percent. On the basis of their digestible nutrients Niger oil cakes may be considered a valuable protein feed.

Rations for self-feeding fattening lambs, G. A. Brown (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 3–7*).—In this test 10 lots of lambs, averaging approximately 47 lb. initial weight, were fed for 88 days to compare hand-feeding and self-feeding and various combinations of corn, oats, linseed cake, oat hulls, and bran when fed with alfalfa hay for fattening. The average daily gains varied from 0.3 to 0.42 lb. per head daily.

The lot that was hand-fed throughout and the lot that was hand-fed until on full feed and then self-fed made similar gains and gave identical gains per lamb. Lambs receiving either ground or cut alfalfa hay mixed with cracked corn gained more rapidly than did those fed both oat hulls and linseed cake mixed with cracked corn. Rations of shelled corn and alfalfa hay or shelled corn, linseed cake, and alfalfa hay produced excellent gains and made practically the same returns above feed costs. Feeding by the cafeteria method and corncob meal proved unsatisfactory.

Lamb feeding costs and returns in Michigan, P. F. Aylesworth (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 26–30, fig. 1*).—Continuing this study (E.S.R., 67, p. 446), 30 lamb feeders cooperated in keeping the necessary records during the feeding season of 1932–33.

There were 22,862 lambs put on feed and 21,833 were sold. The lambs averaged 63.8 lb. initial weight and were on feed for 112 days, during which time they gained 22.1 lb. per head. Of the total fattening cost, feeding made up 75.5 percent, use of buildings and equipment 9.3, interest 5.2, labor 5, and other costs 5 percent. Each pound of gain required 6.6 lb. of grain and 5.7 lb. of roughage, valued at 4.9 c. for the feed. The lambs making the greatest gains had a feed cost of 4 c. per pound of gain as compared with 5.5 c. for the lambs making the slowest gains. The mortality rate was higher where larger numbers of lambs were fed and where lambs were self-fed. Self-fed lambs required less feed per unit of gain and returned more profit than hand-fed lambs. The high-shearing lambs returned the greater profit, due to the good returns from the wool. Over a period of years, October and November proved to be good months for buying feeder lambs, and April and March good months to market fat lambs.

Results of six-years' cross-breeding experiments (*Natl. Wool Grower, 23 (1933), No. 6, p. 19*).—Continuing this study (E.S.R., 69, p. 565), the average of 6 years' results shows that in average final weight per lamb the rankings of lambs out of Rambouillet ewes according to the breed of their sires were Suffolk, Hampshire, Shropshire, Rambouillet, Southdown, and Romney. In average value per lamb, they ranked as follows: Hampshire, Suffolk, Southdown, Shropshire, and Rambouillet. The average dressing percentages were Southdown 51.8, Shropshire 51.1, Suffolk 50.5, Hampshire 50.1 Romney 49.8, and Rambouillet 48.8.

The results indicate that each breed of rams has its special merits, and that the important thing in selecting sires is to adopt a breed suitable to the type of ewes to be bred, the kind of feed, and the conditions under which the sheep are raised.

Productive swine husbandry, G. E. Day (*Chicago and Philadelphia: J. B. Lippincott Co., 1933, 5 ed., rev. pp. X+384, pl. 1, figs. 89*).—This is a revision of the treatise previously noted (E.S.R., 53, p. 69), with the findings regarding feeding and other swine practices, references, and statistical matter brought up to date.

Comparative values of mixed feeds for horses, R. S. Hudson (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 34–39, fig. 1*).—A test covering three summers was undertaken to determine the value of commercial mixtures as compared with farm grains for working horses. The horses were fed each year from April 1 to November 1.

Over the 3-year period the changes in weight of the horses were quite similar regardless of the ration fed. Horses fed crushed farm grains gained somewhat more throughout the test than those on whole grains. Animals that made excessively large gains during the summer usually lost weight during the winter, while those that made smaller gains during the summer usually continued to do so during the winter. The commercial feeds often became sour, caked in the sacks, and dried out during storage. These feeds were also attractive to rats and mice, and during hot weather the molasses in them attracted flies. Farm grains were more economical than the commercial mixtures. Crushing farm grains apparently left the feed as palatable and more digestible than the whole feed, but the use of crushed grains should depend upon the cost of their preparation.

The degree of reliability of poultry feeding experiments, F. J. Dudley (*Harper Adams Util. Poultry Jour., 18 (1932–33), No. 6, pp. 257–261, fig. 1*).—In this article from the National Poultry Institute, England, the author discusses the significance of experimental results. It is pointed out that while repetition of experiments in different years and under varying climatic conditions is of value, it is of as great or greater importance to duplicate or replicate the experiment at the same time and place and under similar conditions.

The nutritional requirements of the chick, A. G. Hogan and R. V. Boucher (*Missouri Sta. Res. Bul. 198 (1933), pp. 24, figs. 9*).—Continuing the study of synthetic diets (E.S.R., 65, p. 559), it was found that when such diets contained the usual percentage of yeast they were inadequate for chickens. Such diets were not improved by increasing the vitamin A and D allowance, but were improved by increasing the amount of yeast.

Tests of soluble supplements to discover one that contained the factor in which yeast was deficient showed that ether extract of egg yolk and tikitiki offered some promise, and that acid-hydrolyzed yeast was extremely promising. An extract of liver carried the factor, but 10 percent of this extract was required to make the ration adequate. Even when 20 percent of a water extract of yeast replaced the yeast itself, the results were not reliable. The factor in which this water extract was deficient was supplied by a combination of acid-hydrolyzed yeast and ether extract of egg yolk.

A ration was formulated which contained all of the vitamins in soluble form carried by acid-hydrolyzed yeast, ether extract of egg yolk, a liver extract, and tikitiki. Chicks were successfully raised through one generation on this ration, and birds of the second generation had come into production. Each of the vitamin carriers contained an essential factor that was not present in the others in large amounts, but some of the carriers undoubtedly contained more than one factor and further isolation was not possible because all the factors were soluble either in water or ether.

Digestion experiment of soy bean cake and kaoliang with poultry, K. Suzuki (*Bul. Agr. Chem. Soc. Japan, 7 (1931), Nos. 9–12, pp. 82–84*).—Digestion trials with 2-year-old White Leghorn cocks at the Imperial Zootechnical Experiment Station, Chiba, gave the following average digestion coefficients for soybean cake and kaoliang: Organic matter, 67 and 75.3 percent; crude protein, 84.8 and 22.4; crude fat, 91.8 and 65; crude fiber, 2.2 and not given; nitrogen-free extract, 40.7 and 85.9 and pure protein, 90.7 and 27.5 percent.

Relation of ventilation in an electric brooder to health and growth of chicks, J. E. Dougherty and B. D. Moses (*Poultry Sci., 12 (1933), No. 2, pp. 141–143*).—The results of 11 trials with electric brooders at the California Experiment Station showed that the development of dampness in the brooder preceded serious contamination of the air by a rather wide margin. Circulating air at the rate of 1 cu. ft. per 100 chicks per minute was not rapid enough to prevent excessive condensation of moisture or to meet the needs of the chicks up to 6 weeks of age. While a rate of circulation of 2 cu. ft. per 100 chicks per minute met the requirements of the chicks, it was not enough to keep the hover dry after the chicks were 3 weeks old. As much as 4 cu. ft. of air would not keep the hover entirely dry until the chicks were 6 weeks of age. When the ventilation was so regulated as to keep the hover reasonably dry, the chicks themselves received ample air. Excessive ventilation had no beneficial effect on the chicks, caused an undue dissipation of heat, and greatly increased the consumption of electricity.

Effect of dietary and environmental factors on the pH of the intestinal tract, F. E. Mussehl, M. J. Blish, and C. W. Ackerson (*Poultry Sci., 12 (1933), No. 2, pp. 120–123*).—At the Nebraska Experiment Station a study was undertaken to determine the possibilities of using pH values of the contents of the digestive tract of chickens as a measure of the efficacy of certain antirachitic agents. The results indicated that the method could not be used to diagnose the presence or absence of rickets or rachitogenic conditions, since the birds apparently could maintain a fairly constant pH in each section of the digestive tract regardless of whether the ration was inherently alkaline or acid. The physiological disturbance in one case where 4 percent of sodium bicarbonate was added to the ration was so great as to produce a pathological abnormality, yet the pH of the digestive tract did not vary appreciably from the controls.

Factors involved in malformation of the bones of growing chickens.—I, The value of egg yolk and chicken fat, E. W. Henderson (*Poultry Sci., 12 (1933), No. 2, pp. 91–96, fig. 1*).—A basal ration of three common grain products, bone meal, and salt was fed to eight lots of 25 White Leghorn chicks each, housed in battery brooders at the Iowa Experiment Station in an effort to reproduce leg deformities in such chicks and to determine the cause of this condition. The basal ration was supplemented with various amounts of protein concentrates, and in some cases cod-liver oil and chicken fat were added.

The results of the study showed that the deformities resulting from battery brooding or the all-mash method of feeding or both were probably rickets, but they were not prevented by feeding cod-liver oil. Egg yolk known to contain vitamin D did not cure this type of rickets, nor did chicken fat possess any curative properties. It was thought that this type of rickets was due to an excess of calcium or phosphorus or both. When the calcium and phosphorus both exceeded 1.8 percent of the total ration, the percentages of deformities and retarded growth were high.

Calcium-phosphorus metabolism in the chicken.—IV, Ergosterol requirement of growing chicks, E. J. King, H. Hull, and G. E. Hall (*Poultry Sci., 12 (1933), No. 2, pp. 129–132*).—Continuing this series of studies (E.S.R., 66, p. 660) at the University of Toronto, it was found that irradiated ergosterol was not as effective as cod-liver oil in preventing rickets in chickens. The difference in the antirachitic power of these two sources of vitamin D was not so great with a ration containing a normal calcium-phosphorus ratio as when these minerals were present in an abnormal ratio. There were some indications that irradiated ergosterol was more effective when administered orally than when mixed with the feed.

The influence of certain supplements on the production, hatchability, fertility, and weight of eggs, R. M. Smith (*Arkansas Sta. Bul. 293 (1933), p. 18*).—Continuing these studies (E.S.R., 66, p. 566), it was found that the egg production of confined pullets was not materially influenced by any of the supplements added to the basal rations. The only supplement that increased production of birds on gravel range and limited green feed or receiving sunlight without range was cod-liver oil or combinations of cod-liver oil, alfalfa leaf meal, and germinated oats.

Germinated oats and alfalfa leaf meal increased the hatchability of eggs of confined pullets, but minerals and cod-liver oil had no such effect. When sunlight was available, only cod-liver oil with alfalfa leaf meal increased hatchability. As the sole supplement alfalfa leaf meal was the most effective in maintaining hatchability. Each of the supplements tested increased fertility of eggs when added to the ration of confined pullets, but for pullets exposed to sunlight the only supplement to have any effect was cod-liver oil and it caused a decline in fertility. Germinated oats feeding resulted in a consistent increase in the average weight of eggs regardless of the method of housing. The combination of cod-liver oil with alfalfa leaf meal as a supplement for pullets receiving sunlight increased egg production and hatchability, but the addition of separate supplements had no effect. It was concluded that the addition of a supplement to the basal rations used in this study was of little benefit when the birds had access to sunlight.

Some factors affecting egg weight in the domestic fowl, R. T. Parkhurst (*Poultry Sci., 12 (1933), No. 2, pp. 97–111, figs. 2*).—An analysis was made of some of the records of the National Institute of Poultry Husbandry, England, in an effort to determine the effect of various methods of feeding and management on egg weight.

Housing White Leghorn and White Wyandotte pullets behind ordinary window glass and not providing adequate amounts of vitamin D resulted in significantly lower average egg weights than were obtained in comparable pens receiving sufficient quantities of vitamin D. Egg size was practically the same in pens receiving cod-liver oil and irradiated ergosterol, and there was no significant difference in size in lighted and unlighted pens. A ration fed in pellet form produced a somewhat larger egg than the same ration fed in mash form with both pullets and yearlings. Both green feed and oyster shell proved valuable for increasing egg size when supplementing a pellet ration.

Fish meal was materially better for improving egg size than peanut meal and slightly better than extracted soybean meal or meat meal. A mineral supplement was of no particular value with a meat meal ration, unlimited oyster shell being available. Extra quantities of dried skim milk fed to crossbred pullets did not materially affect egg size. Varying the protein content of the ration when the mineral content remained the same did not have any significant effect, and a complex protein was no more effective than a simple protein for increasing egg size. Replacing meat and bone meal with fish meal, dried skim milk with dried buttermilk, or extracted soybean meal with peanut meal did not affect the egg size of either Leghorn pullets or yearlings. There were some indications that a turning point in an egg weight cycle occurred about April or May.

Temperature and its effect on egg size in the domestic fowl, N. L. Bennion and D. C. Warren (*Poultry Sci., 12 (1933), No. 2, pp. 69–82, figs. 3*).—Based on the records of the poultry flock at the Kansas Experiment Station during the years 1921–22 and on 32 White Leghorns kept in individual batteries in a temperature-controlled room in 1932, this study was made to determine the effect of temperature on egg size. Daily maximum and minimum temperatures for these periods were used in this study.

The mean weekly egg weight compared with the mean weekly temperature showed a sharp decline when the temperature was over 85° F. Under controlled conditions the application of high temperatures reduced the mean daily egg size from 15 to 20 percent, and the rate of decline was more rapid than the increase when the temperature was lowered. While all the components of the egg decreased under high temperature, the shell and albumen decreased proportionately more than the yolk, indicating that the oviduct was more sensitive to high temperatures than the ovaries. Birds were more sensitive to sudden changes in temperature than to gradual changes, but extremes of temperature in either direction were followed by a decline in production. When exposed to high temperatures, birds consumed 12 percent less feed than at moderate temperatures, but this factor was not responsible for the decline in egg size.

White Leghorns and Rhode Island Reds reached their maximum egg size during the early part of February, and from that date until summer temperatures began to have their effect there was little fluctuation in size. The results also indicated that a dependable measure of an individual's maximum egg size could be obtained by weighing the first 10 eggs produced in April. When comparing egg size of birds from different parts of the country, the temperature and its effect on egg size should be taken into consideration.

The solids content of egg white, H. J. Almquist and F. W. Lorenz (*Poultry Sci., 12 (1933), No. 2, pp. 83–89, fig. 1*).—Continuing this study (E.S.R., 66, p. 363) at the California Experiment Station, it was found that the mean solids content of the layers of white in any one egg was that of the middle layer of firm white. After short storage periods, the solids content of the different layers of white became the same. An explanation of some commercial "watery whites" lies in the fact that the layer of firm white holds an inner layer of liquid white, and the rupture of the firm white envelope permits the inner liquid white to run out, producing an apparent liquefaction. The ash content was practically constant for the layers of white, and was independent of variations in total solids content. While the solids concentration in the whites of fresh eggs was quite variable, the eggs from one hen were more uniform in this respect than random samples.

Capons and caponizing, R. S. Dearstyne, N. W. Williams, and C. O. Bollinger (*North Carolina Sta. Bul. 290 (1933), pp. 15, figs. 9*).—In this bulletin the authors discuss the advisability of caponizing; the time for caponizing; the operation itself; and the care, feeding, killing, picking, and marketing of capons.

Securing early turkeys by stimulated egg production, W. P. Albright and R. B. Thompson (*Poultry Sci., 12 (1933), No. 2, pp. 124–128*).—At the Oklahoma Experiment Station breeding turkeys were kept closely confined with satisfactory results. Egg production was stimulated by the use of a laying mash and morning lights, beginning the first of December. With this system of management the first egg was laid on December 26, and a pullet reached sexual maturity at 237 days of age. The peak of egg production was reached in March, and the first poults were hatched in February. The average fertility of the eggs of these turkeys was 86.2 percent and the average hatchability 67.3 percent. The turkeys consumed an average of 6.9 lb. of mash, 7.2 lb. of grain, and 0.6 lb. of oyster shell per month.

DAIRY FARMING—DAIRYING

The feeding value of artificially dried young grass, II, O. M. Camburn (*Vermont Sta. Bul. 359 (1933), pp. 14*).—Continuing this study (E.S.R., 68, p. 807), the production value of artificially dried young grass was compared with that of a grain mixture by feeding trials with two groups of milking cows. The dried grass contained 20 percent of crude protein, 14.2 percent of digestible crude protein, 17.6 percent of crude fiber, 40.2 percent of nitrogen-free extract, 3.4 percent of ether extract, and 63.6 percent of total digestible nutrients as compared with 20.4, 16.7, 6.3, 51.9, 4.5, and 72.9 percent, respectively, in the grain mixture. The hay and silage ration was one third less with the dried grass ration than with the grain ration.

The production of milk, fat, and solids-not-fat was essentially the same with both rations. While the cows on the grass ration consumed a little more total digestible nutrients than those on the grain ration, the gains in body weight more than accounted for the difference. It is concluded that the dried grass ration was equal to or slightly better than the grain ration.

Grass silage, C. Boyle and J. J. Ryan (*Roy. Dublin Soc. Econ. Proc., 2 (1933), No. 31, pp. 515–528, figs. 3*).—Tests at University College, Cork, showed that grass approaching the mature stage and grass in the aftermath stage could be made into good silage by the pit method. During the process of ensiling approximately 18.5 percent of the dry matter and 25 percent of the starch equivalent were lost. Feeding tests with dairy cows showed that silage made from aftermath could be used to replace all of the hay or all of the roots or portions of the hay and roots in the ration. On the basis of these results it was found that 7 lb. of hay and 28 lb. of roots could be replaced by 35 lb. of silage.

A comparison of cottonseed hulls and grass hays for milk production, R. H. Lush, C. H. Staples, J. L. Fletcher, and S. Stewart (*Louisiana Stas. Bul. 238 (1933), pp. 8*).—A series of three experiments, in which two groups of four cows each were used, was undertaken to determine the relative feeding value of cottonseed hulls. The single reversal method of feeding with a 10-day preliminary feed adjustment period was followed in every case.

When supplemented with calcium, green feed, and protein, cottonseed hulls were superior to hill land carpet and Bermuda grass hay, about equal to high-quality Bermuda, but somewhat inferior to mixed clover hay for milk production. Under the conditions of this test when cottonseed hulls were selling at $8 per ton, the feed replacement values for Bermuda, grass hay, and mixed clover hay were $9.73, $3.93, and $11.41 per ton, respectively.

High versus low protein grain with pasture, R. E. Horwood and G. W. Putnam (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 20–22*).—Using two groups of three cows each during two summers, this test was undertaken to determine if a low-protein grain mixture, made up of home-grown feeds, was as effective as a high-protein mixture for milk production, general health, and maintenance of body weight when fed to cows on pasture. The high-protein ration contained 16.7 percent and the low-protein ration 9.3 percent of digestible crude protein. The cows on the low-protein diet produced 86.6 lb. more milk than those on high protein. There was a slight advantage in favor of the high-protein diet in the maintenance of body weight but no difference in the general health of the animals.

The nutritive value of proteins for milk production.—I, A comparison of the proteins of beans, linseed, and meat meal, S. Morris and N. C. Wright (*Jour. Dairy Res. [London], 4 (1933), No. 2, pp. 177–196, figs. 5*).—In this study at the Hannah Dairy Research Institute, Scotland, an attempt was made to determine the comparative values of the proteins of beans, linseed meal, and meat meal for milk production. The study was carried out with four cows in the same stage of lactation fed through four periods of four weeks. The protein feeds were fed as supplements to a ration of oats, straw, and beet pulp. The maintenance ration was fed at the rate of 6 lb. of starch equivalent and 0.6 lb. of protein equivalent per 1,000 lb. of live weight, while the production ration was fed at the rate of 0.44 lb. of protein and 2.5 lb. of starch equivalent per 10 lb. of milk. The mean biological values of the proteins were calculated according to the formula of Perkins (E.S.R., 54, p. 768).

Under the conditions of this experiment the beans provided a better source of protein for milk production than linseed meal or meat meal. The relative values of the mixed rations containing these concentrates were for bone meal 59, meat meal 55, and linseed meal 46.

Effect of calcium-deficient roughages upon milk production and welfare of dairy cows, R. B. Becker, W. M. Neal, and A. L. Shealy (*Florida Sta. Bul. 262 (1933), pp. 28, figs. 6*).—The results reported in this investigation were obtained with Jersey cows that had been on a calcium-deficient ration for a long-continued period. The degree of depletion of mineral reserves in the skeletons of these cows was sufficient to weaken the bones to such an extent that a significant number of the animals had suffered broken bones.

The results showed that when grass forages and silages grown on acid sandy soils and containing relatively small amounts of calcium were fed to dairy cows the milk production was reduced, even when a high protein concentrate was fed in such amounts that the animals were fat. Adding 2 percent of bone meal to the concentrates and feeding 5 lb. of alfalfa hay resulted in a marked increase in milk production without increasing the flesh of the cows. Under this system of feeding, minerals were stored in the skeleton to such an extent that the shaft bones were above average in strength. Reproduction was found to be a smaller drain on the calcium and phosphorus of the body than was lactation. A 2 percent level of bone meal was slightly more than a Jersey cow producing approximately 6,000 lb. of milk per lactation required for maintaining her body functions.

A study of the phosphorus requirement of dairy cattle.—I, Phosphorus requirement for growth and reproduction from three months of age to first calving, C. F. Huffman, C. S. Robinson, C. W. Duncan, L. W. Lamb, and M. F. Mason (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 203–223, fig. 1; abs. in*

Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 43).—Two lots of seven grade Holstein heifers each were placed on experiment at 90 days of age to determine the phosphorus requirements of dairy cattle for growth, reproduction, milk production, and health over a period of five years when alfalfa furnished the principal source of protein. Lot 1 received the basal ration, low in phosphorus and made up of alfalfa hay, corn silage, yellow corn, and salt. Lot 2 received the same ration supplemented with special steamed bone meal. The basal ration contained about 0.2 percent of phosphorus and the other ration 0.41 percent of phosphorus on a dry-matter basis. The phosphorus intake in lot 1 varied from 5.7 to 9.9 g and in lot 2 from 10.3 to 19.7 g daily during the first 18 months. This paper reports results to first calving.

The ration used in lot 1 caused an immediate lowering of the inorganic blood phosphorus, and this value remained lower than normal during the 18 months. The blood calcium values were highest at the time when the phosphorus values were lowest, but were never above the normal range in calcium value. The heifers in lot 1 exhibited depraved appetite and a reduced appetite for hay and silage.

The ration in lot 1 was insufficient when the calcium-phosphorus ratio was from 4:1 to 5:1 and when the sources of vitamin D were alfalfa hay and sunshine. The ration in lot 2 appeared to furnish sufficient phosphorus up to 6 months of age when the daily intake was 10.3 g of phosphorus, while from 10 to 12 g furnished enough phosphorus for normal growth, maintenance, and the development of the fetus from 18 months to age at first calving. During gestation the blood calcium and phosphorus values were normal in both groups, and the phosphorus values in both groups decreased markedly just before parturition.

Rickets in calves, S. I. Bechdel et al. (*Pennsylvania Sta. Bul. 291 (1933), pp. 41, figs. 17*).—This investigation was undertaken to determine whether the information obtained concerning vitamin D on rats and other species is applicable in the nutrition of dairy calves and to study the antirachitic value of sun-cured and dehydrated hays and oat straw for calves. A ration previously tested for its rachitogenic properties (E.S.R., 60, p. 365), supplemented with dried beet pulp as the sole roughage, was fed to four lots of three male calves each from the time they were about 4.5 months of age until they were slaughtered at an average age of 10 months. The control group received the basal ration only, the second group was irradiated with a carbon arc lamp, the third group had the concentrate portion of its ration irradiated for 15 minutes daily, and the fourth group received 25 cc of cod-liver oil per head daily.

Lack of the antirachitic factor resulted in a decreased growth rate, abnormal bone development, swollen joints, slight paralysis of the hind quarters, and a bowed back. These conditions were associated with a low percentage of ash in the skeleton. Irradiating either the calves or their feed was equally effective in increasing the deposition of ash in the bones and in preventing the onset of rickets. Cod-liver oil feeding resulted in somewhat better growth and thriftiness, but the bones were slightly inferior in quality to those produced by irradiation. It was concluded that calves require vitamin D for satisfactory bone development and general health.

In a second experiment a basal rachitogenic ration composed of whole milk and a grain mixture was fed to calves from birth to 30 days of age. After this period skim milk was substituted for whole milk, and feeding continued until the calves were 6 months old. The following supplements were fed with the basal diet: Sun-cured alfalfa, dehydrated alfalfa which had had little or no exposure to the sun, activated ergosterol, irradiation of the calves with a carbon arc lamp, devitalized (A and D) cod-liver oil, and oat straw. Results were obtained with 24 calves, and the antirachitic potency of the hays was checked in trials with rats.

There was an appreciable difference in the antirachitic potency of the artificially dehydrated and sun-cured alfalfa hay. A severe rachitic condition developed during a 6-months feeding period when 1 lb. of artificially cured hay was added to the basal diet, and a mild rachitic condition when 1 lb. of sun-cured hay was added. As much as 2.5 lb. of artificially cured hay did not prevent the development of a mild rachitic condition, while the same amount of sun-cured hay prevented the appearance of rickets. Activated ergosterol and 30 minutes' daily exposure to ultraviolet light prevented or cured rickets in calves. Oat straw also had a considerable amount of the antirachitic factor.

Bulls' ages show further increase, A. C. Baltzer (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 16, 17*).—A survey of bulls listed and recorded by Michigan cow testers showed that the average age of 350 bulls was 4.5 years. This was a gain of 0.4 of a year per bull over the average age reported in 1931 (E.S.R., 67, p. 448).

Concerning bull indexes, I–III, V. A. Rice (*Guernsey Breeders' Jour., 43 (1933), Nos. 7, pp. 212, 213, 223; 8, pp. 238, 239, 261, 262; 9, pp. 272–274, 302*).—In this series of articles from the Massachusetts Experiment Station the theory on which bull indexes are based is reviewed, as are also several indexes now in use. The Advanced Register records of the Guernsey breed were used to study whether the use of an index would permit predicting the production level of daughters of a young untried sire when the production level of the dams was known.

It was found that the amount of milk and percentage of butterfat in cattle behave in transmission as do many other quantitative characters. The average production of daughters of a bull falls approximately half way between the production level of the bull and the average production of the cows to which he is bred. Any index used should be based on a comparison of daughter and dam records and should give the bull a numerical rating for these factors. An Intermediate Index, based on the intermediate inheritance half way between the average of the dam's record and the bull's index, was found to be simple and easy to use. When used on the first 10 daughters of a bull out of tested dams, an estimate of the future daughters could be made with from 7 to 8 percent of correctness. When used on bulls and cows in a pedigree a fairly accurate estimate can be reached regarding the probable production of a young untried bull's daughters.

A contribution to the study of the level of blood lipids as an indicator of the productive capacities of the dairy cow [trans. title], **J. Marcq and A. Devuyst** (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 2 (1933), No. 2, pp. 101–126, figs. 4; Dutch abs., pp. 122, 123; Ger. abs., pp. 123, 124; Eng. abs., pp. 125, 126*).—In making this investigation, the authors did not consider the influence of such variables as age and diet and took note only of the error pertaining to the time of taking blood samples during the course of lactation.

Coefficients of correlations were worked out when extraction was made by means of ether only and also when made by means of alcohol-ether-acetone. In the first case no correlations were significant, while only the correlation between total blood lipids and lecithins was significant for the second method of extraction. The correlations between mean total lipids and butter yield and between mean lecithins and total butter production were slightly positive. The results indicate the need of further studies on the relations between the total lipids and lecithins and the yield in butter during a lactation period.

Milk-energy formulas for various breeds of cattle, O. R. Overman and W. L. Gaines (*Jour. Agr. Res. [U.S.], 46 (1933), No. 12, pp. 1109–1120, figs. 5*).—In this paper from the Illinois Experiment Station a comparison was made between the different breeds of dairy cows with respect to milk energy. The comparison was based on 212 analyses (E.S.R., 56, p. 490), which included direct energy determinations and another set of 1,999 analyses (E.S.R., 61, p. 466) classified by the breed of cow.

Based on fat, protein, and lactose only, the following values in calories per gram of milk were found: Fat, 9.253±0.065; protein, 5.853±0.127; and lactose, 3,693±0.059. For all practical purposes, it is concluded that a single formula could be used for all breeds, which could be expressed in terms of 4 percent milk as 4 percent milk=0.4 M+15 F, in which M is the weight of milk and F the weight of fat. One kilogram of 4 percent milk equals 750 calories or slightly more.

The protein-energy ratio was roughly constant, lying usually within the limits of from 43 to 49 mg of protein per calorie. With respect to the protein and energy content, the human food value of natural cows' milk was proportional to the amount of 4 percent milk by the above formula. In making a usable feeding standard for milk production, the protein and energy requirements of lactation could be expressed as simple multiples of the 4 percent milk produced by the above formula, and it would be necessary to determine only the digestible protein and energy of feeding stuffs.

British breeds of milch goats, S. L. Hunt (*Jour. Min. Agr.* [*Gt. Brit.*], *40* (*1933*), *No. 2*, *pp. 141–145*, *pls. 4*).—The distinctive characteristics and features of the more important types of milk goats in England are described.

Variation in the composition of milk in certain midland districts of England during the years 1923–31, A. G. Baker and H. T. Cranfield (*Jour. Dairy Res.* [*London*], *4* (*1933*), *No. 2*, *pp. 246–254*, *figs. 12*).—An analysis was made of the milks received at milk depots in the counties of Cheshire, Staffordshire, Derbyshire, and Leicestershire, England. The data obtained were tabulated to obtain information on variations in composition due to the district in which the milk originated, to the month of the year, and to the year itself. The results of the tabulations are presented in the form of graphs.

The data indicated a positive correlation between rainfall and average composition of milk for each year. It was found that during the month of August there was less variation between years in contrast to December, where wide variations occurred.

The composition of the "isotonic diluent" in samples of milk low in solids-not-fat, W. L. Davies (*Jour. Dairy Res.* [*London*], *4* (*1933*), *No. 2*, *pp. 273–278*).—The National Institute for Research in Dairying undertook a study of milk with the idea that the secretion from cows giving milk low in solids-not-fat contained a diluent poor as regards its content of compounds of high molecular weight and caloric value.

In more than 200 samples of normal milk the casein nitrogen accounted for approximately 76 percent of the total nitrogen. Milk samples low in solids-not-fat had a casein nitrogen content below this level. This suggested that milk was made up of two fractions, (1) a true milk fraction and (2) an isotonic diluent. The chloride content of the diluent was approximately arrived at and was nearly isotonic with a hypothetical nonlactose-containing milk.

The author discusses the similarity of this diluent to either a modified blood serum or lymph serum or a casein- and lactose-free lacteal secretion. Its high chloride content favored its similarity to either the lymph serum or an "exudate" closely allied to lymph serum from pathological secretory tissue. The possibilities of after-effects from mastitis attacks causing a chronic catharrhal condition of the udder and being the cause of the secretion of this diluent are also discussed.

Some observations on cow's milk poor in non-fatty solids, G. L. Peskett and S. J. Folley (*Jour. Dairy Res. [London], 4 (1933), No. 3, pp. 279–284*).—Studies were carried out at the National Institute for Research in Dairying on the blood and milk of cows in a herd of British Friesians. The work was divided as follows: Detection of blood serum albumin in milk and (2) comparison of the composition of milk poor in solids-not-fat with that of a mixture prepared from normal milk and blood serum.

Traces of blood serum albumin were found in normal milk. This content was increased in many milks low in solids-not-fat, and there was evidence of some correlation between low solids-not-fat and high blood serum albumin content. Deficiency of nonfatty solids in milk may in some cases be due to dilution of a normal secretion in the udder by a fluid of the nature of edema fluid. There was some evidence that the present method of determining casein nitrogen of milk may be slightly high, and that the accuracy of globulin figures may be open to doubt.

Should the mineralization and vitaminization of milk become general? W. E. Krauss (*Ohio Sta. Bimo. Bul. 164 (1933), pp. 126–129*).—In this article the author discusses the probable effect of the general mineralization and vitaminization of milk, holding that it would "further complicate an already complicated situation", and would jeopardize the excellent position this product now holds in the eyes of the general public and the medical profession.

Studies in the bacteriology of low-temperature pasteurisation.—I, The significance of heat-resisting organisms in raw milk supplies, E. B. Anderson and L. J. Meanwell (*Jour. Dairy Res. [London], 4 (1933), No. 2, pp. 213–225*).—The authors undertook this study to determine the distribution and means of control of heat-resisting organisms found during the course of routine bacteriological examinations of milk received at pasteurizing plants in England.. Samples of milk were pasteurized in the usual manner under laboratory conditions, and bacteriological examinations were made immediately before and after processing. A standard agar medium, to which was added 0.5 percent of sterile milk, was used for the study.

It was found that the enriched medium was satisfactory for the control of pasteurized milk. A great variation was discovered in the number of heat-resisting organisms in raw milk from different sources. Under ordinary farm conditions where utensils were not sterilized, more of these organisms were present in machine-drawn than in hand-drawn milk. No constant relationship was found between the number of organisms in raw milk and in the same milk after pasteurizing. The development of these organisms was encouraged on farms where the milk was not cooled. The surfaces of unsterilized utensils were frequently the sources of these organisms, and sterilization largely eliminated the organisms from milk. On the basis of the results obtained in this study, it was found that a simple quantitative plate count of raw milk gave little information as to the suitability of milk for pasteurization.

Coliform organisms in milk and bovine faeces, P. M. Kon (*Jour. Dairy Res. [London], 4 (1933), No. 2, pp. 206–212*).—This investigation was undertaken at the National Institute for Research in Dairying to study coliform organisms. The term coliform in this study was restricted to Gram-negative, nonspore-forming facultatively anaerobic organisms, fermenting lactose in the presence of bile salt, with the production of acid and gas.

A large proportion of the organisms recovered from raw milk by direct plating were of the *Bacterium aerogenes* type with a number of "intermediates" also present. *B. coli* was largely predominant in feces, while the proportion of *B. aerogenes* was very small. On the basis of this study it may be assumed that many of the coliform types of organisms found in milk originate, not from feces, but from some external source such as contaminated utensils or feeding stuffs.

A bacterial milk taint, A. CUNNINGHAM (*Jour. Dairy Res.* [*London*], *4* (*1933*), *No. 2, pp. 197–205*).—A study was undertaken at the College of Agriculture, Edinburgh, in an effort to isolate an organism from milk that produced an aroma closely resembling that of amyl alcohol and a flavor that was slightly oily.

It was found that the amyl alcohol aroma was due to the growth of white and orange micrococci, similar to those described as *Micrococcus caseolyticus*. The taint was noticeable when cows were housed, but disappeared when they were put on grass. The source of the causal organism was found to be the floor of the cowshed. Washing and disinfecting the floor removed the source of the trouble. The off odor could be reproduced in media which contained leucine as the sole organic compound.

The mode of combination and distribution of traces of heavy metals in dairy products, W. L. DAVIES (*Jour. Dairy Res.* [*London*], *4* (*1933*), *No. 2, pp. 255–264*).—The National Institute for Research in Dairying made a study of the distribution of metals between the various fractions of milk, such as butter and buttermilk from cream, and cream and separated milk from whole milk, and also made an effort to determine the diffusibility of heavy metals through membranes and the potentiometric measurements of their ionic activity under different conditions.

The results showed that small amounts of heavy metal were distributed between cream and separated milk in proportion to the curd nitrogen, but upon complete centrifuging of the fat a higher concentration of metals occurred in the cream, indicating adsorption of complex proteinate at the fat-globule surface. Heavy metals entering into butter were not affected by the acidity of the cream but by the curd-nitrogen content of the butter, while the copper associated with the curd in butter was approximately twice that associated with the protein nitrogen of the buttermilk. The entry of heavy metals into the fat phase in the absence of protein was greatest at neutrality and decreased with increasing acidity. The presence of protein slightly increased the amount of heavy metal entering into the fat due to the adsorption and buffering effects of the protein at the oil-water interface in the emulsion.

The amount of diffusible heavy metal increased directly with the acidity and paralleled the diffusion of hydrogen ions. The concentration of the tonic form of heavy metal in milk was low, but increased with increasing acidity. This finding was confirmed by the potentiometric measurements of milk containing known amounts of heavy metals and by the addition of milk to a standard copper solution at different acidities.

Effect of the time element in marketing cream for buttermaking on quality, V. C. MANHART (*Indiana Sta. Bul. 383* (*1933*), *pp. 12, figs. 6*).—This investigation was undertaken to study the effect of the time element in marketing of station cream on its quality when transported by motor truck to the creamery. A total of 10 cream-buying stations, located at distances of from about 40 to 120 miles from the creamery, were selected for this study. All of the stations were purchasing their cream on the basis of the 4-day delivery plan (E.S.R., 69, p. 138). Samples of both premium and regular cream were churned at the creamery, and the butter so made was shipped to Chicago where it was scored for flavor only, this scoring being taken as an index of the quality of the cream from which it was made.

It was found that butter made from cream delivered at intervals of four days or less scored 1.22 points higher than that made from cream delivered at intervals of five days or more. A higher scoring butter was obtained when the interval between delivery at the station and its processing at the creamery was shortened. The same was true of shortening the interval between the shipment of cream from the station and its processing at the creamery. Butter churned from premium and regular cream on the day of its arrival scored 0.67 and 0.55 points higher, respectively, than that churned on the following day.

The body and flavor of granuled buttermilk, D. B. Goodwillie and G. M. Trout (*Milk Dealer, 22 (1933), No. 5, pp. 42, 43, 64, 65; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 43*).—In a study, at the Michigan Experiment Station it was found that there was little similarity in the chemical and physical properties of cultured and natural buttermilk except in the percentage of total solids. The granule addition method proved to be superior to the churn method for making this product.

Cultured buttermilks with a viscosity above 74.56 centipoise gave the best dispersion of granules, although viscosities as low as 65.56 centipoise could be used. The butter granules had no effect on wheying off. The best flavor and appearance of the product resulted from the addition of from 0.8 to 1 percent of butter granules. The granules should be mixed with the cultured buttermilk at as low a temperature as possible to prevent matting. The addition of from 1.5 to 2 percent by volume of 40 percent cream improved the flavor of the product, especially when the flavor was somewhat off. If equivalent amounts of fat were added, 20 percent cream could be used for this purpose. It is recommended that for the best dispersing properties granules the size of small wheat kernels be used.

The practice of soft cheesemaking, C. W. Walker-Tisdale, T. R. Robinson, and W. E. Woodnutt (*London: George Allen & Unwin, 1930, 5. ed. rev., pp. 116, figs. 10*).—This is a revised edition of the treatise previously noted (E.S.R., 42, p. 270) with information brought up to date.

Cheese-ripening studies: Casein-splitting abilities of lactic acid bacteria, B. A. Eagles and W. Sadler (*Canad. Jour. Res., 9 (1933), No. 1, pp. 44–48*).—Continuing these studies (E.S.R., 69, p. 263), an investigation was made of the casein-splitting ability of each of seven cultures isolated from Kingston cheese. These cultures were Gram-positive, nongelatin-liquefying coccus forms, some of which appeared as chains in young milk cultures and others as pairs.

It was found that two of the cultures failed to attack casein, but the casein-splitting abilities of the other cultures were established and well defined. The type of proteolysis characteristic of two of the latter cultures led to the formation of large amounts of simpler degradation products, while the proteolytic breakdown characteristic of the other cultures was not so complete.

The cultures that were unable to attack casein did attack the nonprotein nitrogenous components of milk, and it was thought that one of these cultures might be capable of protein-synthesizing action.

Discoloration in New Zealand Cheddar cheese: Muddy, pink and bleached defects, I, II (*Jour. Dairy Res. [London], 4 (1933), No. 2, pp. 226–245, figs. 2*).—The results of this study are reported in two parts.

I. *Bacteriological investigations*, G. F. V. Morgan (pp. 226–237).—A discoloration of Cheddar cheese which caused a considerable loss to the producers led to an investigation of this condition by the Department of Agriculture, New Zealand. This paper reports the details of observations made in the laboratory and in cheese stores in New Zealand and England, together with short reports from English laboratories.

The results of these investigations showed that the trouble was due to mold growth in the cheese. The molds gained entrance through trier holes or through cracks in the rind. Various methods of correcting these difficulties were tried, and it was found that trier holes could be most easily sealed by brushing on a little melted paraffin wax. Following this procedure largely eliminated the discoloration.

II. *Biochemical investigations*, G. M. Moir (pp. 238–245).—Biochemical studies involving pH and catalase tests confirmed the evidence that mold growth was closely associated with the production of discoloration in cheese. The pink discoloration appeared to result from the action of acids on the annatto color. Evidence from observation and from other sources indicated that the bleaching was a chemical reduction in which changes in fat entered. The muddy or dark discoloration appeared to be produced by enzymes diffusing into the cheese from centers of mold growth and acting upon chemical substances present in mature cheese.

Proceedings of the twenty-fourth and twenty-fifth annual conventions of the International Association of Milk Dealers: Laboratory and plant sections (*Internatl. Assoc. Milk Dealers, Proc., 24 (1931), Lab. Sect., pp. 126, figs. 12; Plant Sect., pp. 121, figs. 21; 25 (1932), Lab. Sect., pp. 183, figs. 12; Plant Sec., pp. 143, figs. 23*).—At the twenty-fourth meeting (E.S.R., 65, p. 259) held at Atlantic City, N.J., October 29–31, 1931, the following papers were presented before the laboratory section: Acidophilus Milk—From the Laboratory Point of View, by L. F. Rettger (pp. 3–9); Acidophilus Milk—From the Commercial Point of View, by F. W. Howe (pp. 10–12); The Effect of the Temperature of Raw Milk on the Efficiency of Pasteurization, by F. M. Scales and O. Baker (pp. 12–21); Some of the Causes for Unsatisfactory Results with Cultured Buttermilk, Especially from the Standpoint of Flavor, by B. W. Hammer (pp. 21–30); Symposium of Laboratory Tests—(a) Differential Stain for the Direct Microscopic Examination of Milk, by J. Broadhurst and M. A. Long (pp. 30–32); (b) A Modified Babcock Test for Estimating the Fat Content of Chocolate Milk, by F. J. Doan (pp. 33–41); (c) The Hoyberg Test for Milk and Cream, by H. A. Ruehe and R. J. Ramsey (pp. 42–46); and (d) Value of the Fucoma-Gerber Test as Determined in the Country Plant, by L. Warncke (pp. 47–50); Comparison of Tests for the Detection of Sub-clinical Mastitis, by G. J. Hucker (pp. 51–67); How Variations in Incubator Temperatures Affect the Accuracy of Bacterial Counts, by R. S. Breed and C. S. Pederson (pp. 68–87); Beta Lactose: A New By-product of Milk, by P. F. Sharp (pp. 87–96) (E.S.R., 68, p. 666); Factors Involved in the Depth of the Cream Layer on Bottled Milk, by H. H. Sommer and G. C. North (pp. 96–103); The Laboratory's Work on Country Water Supplies, by H. E. Russell (pp. 103–112); Report of Laboratory Methods Committee, by R. C. Fisher (pp. 112–118); and Report of Committee on Washing Compounds and Milk Stone, by A. J. Powers (pp. 118–126).

The following papers were some of those presented before the plant section: Clarify or Filter—Which? by A. R. Hemphill (pp. 3–9); Latest Developments in Flash Pasteurization, by G. W. Putnam (pp. 10–17); Etching and Scratching of Milk Bottles—Causes and Remedies, by J. Jones, 3d (pp. 17–20): Transporting and Handling Bottled Milk to Distributing Stations, by H. Wieland (pp. 20–25); Metals and Milk, by L. Burrell (pp. 52–61); and The Effects of Operating Conditions on Corrosion in Various Parts of Milk Pasteurizing Equipment, by H. A. Trebler, W. A. Wesley, and F. L. LaQue (pp. 62–100).

At the twenty-fifth meeting held at Detroit, Mich., October 17–19, 1932, the following papers were presented before the laboratory section: Increase in Nonlactic Acidity in Raw Cream and Its Control, by P. F. Sharp and J. A. de Tomasi (pp. 3–20); A Critical Study of the Methods for Determining Bactericidal Properties of Chemical Sterilizers, by R. P. Myers and A. H. Johnson (pp. 21–55); How Can the Laboratory Help the Plant and Sales Departments? by H. F. Judkins (pp. 55–63); The Electric Charge on Fat Globules in Milk and

Its Relation to Creaming Ability, by H. H. Sommer and G. C. North (pp. 63–74); Some Factors Other than Bacteria that Influence the Body and Flavor of Granuled Buttermilk, by D. B. Goodwillie and G. M. Trout (pp. 74–80); Some Flavors of Milk and Methods of Their Detection, by G. M. Trout (pp. 80–92); The Significance of Colon Bacteria in Milk with Special Reference to Standards, by J. M. Sherman and H. U. Wing (pp. 93–105); The Relation of Keeping Quality of Milk and Low Bacteria Counts, by T. C. McDonald and J. C. Hale (pp. 105–111); Comparable Standards of Pasteurization Based upon Thermal Death Points of T.B. Bacillus and Thermal Cream Volume Impairment, by A. C. Dahlberg (pp. 112–119); Proposed Changes in the Bacteriological Section of the Standard Methods of Milk Analysis, by R. S. Breed (pp. 119–127); and Symposium on Laboratory Technic.—I, Bacteriologic, (a) Bacteriological Incubators, by M. W. Yale, C. S. Pederson, and R. S. Breed (pp. 127–134); (b) Use of Proper Counting Devices—Arrangement and Presentation, by R. T. Raymond (pp. 135–142); (c) Best Type of Glassware and Size of Dilution Bottles, by L. A. Baumann (pp. 142–144); (d) Development of the Direct Microscopic Technic and Staining Methods, by F. M. Scales (pp. 145–149); II, Chemical, (a) Accuracy of Sampling for Fat Tests at the Weigh Can, by A. J. Powers (pp. 150–157); (b) Weigh Vat Test Variations, by D. H. Bailey, F. M. Twining, J. W. Mitten, and W. D. Swope (pp. 157–170); (c) Short Cuts in Actual Technic of the Babcock Test, by A. C. Dahlberg and A. J. Powers (pp. 171–176).

The following papers were among those presented before the plant section: Influence of Delayed Cooling upon Bacterial Counts in Raw Milk, by J. M. Frayer (pp. 3–16); Watery Layer in Bottled Cream—Its Cause and Prevention, by F. J. Doan (pp. 16–27); The Practical Control of Quality and Uniformity of Cottage Cheese, by H. L. Wilson (pp. 27–34); Shortening the Method of Making Cottage Cheese, by W. V. Price (pp. 35–45); Latest Developments in Refrigeration and Insulation, by H. Sloan (pp. 108–120); and Bottle Washing with Soaker Type Washers—Temperature of Water and Solutions—Alkali Strength and Sterilizing Methods, by R. N. Slawson (pp. 128–142).

VETERINARY MEDICINE

Hoare's veterinary materia medica and therapeutics, edited and rev. by J. R. Greig (*London: Baillière, Tindall & Cox, 1933, 5. ed., rev., pp. VIII+510*).—A revised edition of the work previously noted (E.S.R., 51, p. 678).

Fungous diseases: A clinico-mycological text, H. P. Jacobson (*Springfield, Ill.: Charles C. Thomas, 1932, pp. [17]+317, figs. 153*).—Following an introduction that deals with fundamental considerations, part 1 (pp. 9–74) takes up primary cutaneous mycoses with (usually) no definite involvement, including the dermatomycoses; part 2 (pp. 75–250) deals with primary cutaneous and/or mucous membrane infections with frequent systemic involvement, including moniliasis, maduromycosis (mycetoma), sporotrichosis, blastomycosis, actinomycosis, and Coccidioides (synonyms) (California disease, coccidioidal granuloma); and part 3 (pp. 251–284) takes up primary systemic infections with occasional instances of skin or mucous membrane involvements, including torulosis and aspergillosis. References to the literature follow the several chapters, and author and subject indexes are included. Introductions by J. F. Schamberg and H. Morrow are included.

The diseases of animals transmissible to man, L. Panisset (*Les Maladies des animaux transmissibles a l'homme. Paris: Vigot Bros., 1933, pp. 90*).—The diseases here considered include the animal tuberculoses, rabies, anthrax, the brucelloses, glanders, swine erysipelas, foot-and-mouth disease, forms of diphtheria, psittacosis, dourine and spirochetoses, equine infectious anemia, tularemia, and equine typhoid fever.

Transmission of infectious bulbar paralysis (Aujeszky's disease) to the hedgehog [trans. title], P. Remlinger and J. Bailly (*Compt. Rend. Soc. Biol.* [*Paris*], *113* (*1933*), *No. 22, pp. 557–559*).—The authors' observations here reported show that the hedgehog is very susceptible to the virus of Aujeszky's disease.

Resistance of the virus of Aujeszky's disease to desiccation [trans. title], P. Remlinger and J. Bailly (*Compt. Rend. Soc. Biol.* [*Paris*], *113* (*1933*), *No. 26, pp. 1109, 1110*).—The authors found the virus of Aujeszky's disease to be extremely resistant to desiccation. This is considered to be of considerable importance in the etiology of the affection.

Laboratory methods of diagnosis of Brucella infections, S. G. Rainsford (*Jour. Roy. Naval Med. Serv.*, *19* (*1933*), *Nos. 1, pp. 1–14; 2, pp. 77–92*).—The subject is dealt with under the headings of blood culture, the agglutination test, hemagglutination test, melitin test, and blood picture.

A prophylactic vaccine against hemorrhagic septicemia (barbone), T. Topacio (*Philippine Jour. Agr.*, *3* (*1932*), *No. 4, pp. 251–271, pls. 2*).—A description is given of a prophylactic whole culture vaccine used against hemorrhagic septicemia. Intradermal and subcutaneous injections are considered superior to other routes of vaccination in establishing immunity. Intravenous injections in rabbits failed to effect resistance or immunity.

Salmonella suipestifer infections in man.—Further observations, A. G. Kuttner and H. D. Zepp (*Jour. Amer. Med. Assoc.*, *101* (*1933*), *No. 4, pp. 269–272, fig. 1*).—A report is made of four additional cases of *S. suipestifer* infections in man (E.S.R., 69, p. 582).

The transmission of tularemia by the domestic cat, M. M. Collins (*New Orleans Med. and Surg. Jour.*, *86* (*1933*), *No. 2, pp. 105, 106*).—A case is reported proving serologically that the cat may be an infective carrier of *Bacterium tularense* to human beings.

The status of Escherichia astheniae (Dawson) Bergey et al., M. W. Yale (*Cornell Vet.*, *23* (*1933*), *No. 3, pp. 306–308*).—Studies at the New York State Experiment Station here reported led to the recommendation that *Bacterium astheniae* Dawson be dropped because its nature cannot be definitely determined on account of a faulty original description. It is thought that this organism was either *E. communior* (Durham) Bergey et al. or *E. coli* (Escherich) Cast. & Chalm.

The blood picture of normal laboratory animals, R. A. Scarborough (*Yale Jour. Biol. and Med.*, *3* (*1930*), *Nos. 1, pp. 63–80; 2, pp. 169–179; 3* (*1931*), *Nos. 3, pp. 267–282; 4, pp. 359–373; 5, pp. 431–440; 6, pp. 547–552; 4* (*1931*), *Nos. 1, pp. 69–82; 2, pp. 199–206; 4* (*1932*), *No. 3, pp. 323–344*).—This is a systematic digest of the literature reporting work that had been published up to the close of 1926 on the blood of the normal rabbit, guinea pig, rat, dog, horse, pig, cattle, sheep, the goat, monkey, chicken, birds, and the frog, respectively. A list of 629 references to the literature cited is appended (pp. 328–344).

[Contributions on animal pathology] (*Arch. Wiss. u. Prakt. Tierheilk.*, *63* (*1931*), *Nos. 1, pp. 1–90, figs. 22; 2, pp. 91–188, figs. 16; 3, pp. 189–282, figs. 15; 4, pp. 283–367, figs. 32; 5, pp. 371–474, figs. 28; 6, pp. 475–560, figs. 11*).—The contributions presented (E.S.R., 69, p. 710) include the following: The Amyloidosis of Serum Horses, by H. J. Arndt (pp. 1–11); The Results of Comparative Hematological Investigations, by K. Bürker (pp. 12–22); Nonspecific Reactions to Tuberculin in Horses Affected with Infectious Anemia, by O. Dehner (pp. 23–32); The Veterinary Instruction in Agricultural Schools, by Denzler (pp. 33–37); Enzootic Infectious Encephalitis in the Equine and Bovine: Borna

Disease and Malignant Catarrhal Fever, by W. Ernst (pp. 38–44); The Importance of Care of the Claws in Cattle Hygiene, by A. Fischer (pp. 45–52); Granulations in the Central Nervous System in Pseudorabies (Aujeszky's Disease) and Experimental Acute Anterior Poliomyelitis, by F. Gerlach and F. Kress (pp. 53–64); A Contribution to the Bacteriological Diagnosis and Vaccine Therapy of Stereptococcic Mastitis of Cattle, by P. Krage and W. Gipmann (pp. 65–77) (E.S.R., 68, p. 94); Piroplasmoses and Splenectomy, by H. Miessner (pp. 78–90); Serum and Antivirus Treatment of Strangles and of Purpura Hemorrhagica, by K. Neumann-Kleinpaul and W. Rüscher (pp. 91–103); Paroxysmal Tachycardia and Partial Heart Block in a Saddle Horse with Aortic Insufficiency, by Nörr (pp. 104–119); The Malignant Eczema of the Hare (*Lepus europaeus*), a Form of Staphylomycosis, by A. Olt (pp. 120–135); Investigations of Psittacosis, by R. Reinhardt (pp. 136–146); Experimental Control Work with Bovine Infectious Abortion with Trypan Blue, by J. Rudolf (pp. 147–153); Contribution to the Knowledge of the Neoplasms of the Domestic Fowl, by K. Schuchmann (pp. 154–166); The Histological Classification of the Nonpurulent Forms of Encephalitis of Domestic Animals, by O. Seifried (pp. 167–180); Machens' Antiformin Enrichment Method of Isolating Tubercle Bacilli from Mucus Samples Collected from the Pharynx for Microsocopical Identification Checked by Animal Inoculation, by C. Söntgen (pp. 181–188); The Omentum in Its Relation to the Peritoneum and to the Abdominal Viscera in the Domestic Mammals, by Von Sussdorf (pp. 189–200); Experiments on the Chemotherapy of Experimental Foot-and-Mouth Disease, by K. Trautwein (pp. 201–214); Can Calcium Phosphate Obtained in the Manufacture of Gelatin from Bones Contain Infective Anthrax Spores? by W. Wedemann (pp. 215–229); Acropachy in the Horse, by D. Wirth and A. Pommer (pp. 230–238); Vaccination against Malignant Edema, by J. Witte and J. Schaaf (pp. 239–261); Tolerance, Allergy, and Vaccination Experiments with B.C.G. in Guinea Pigs, by H. Zeller and K. Beller (pp. 262–274); A Singular Deficiency Disease of Cattle Observed in Württemberg, by A. Gminder (pp. 275–282); Experiments on the Action of Disinfectants Used in Combating Foot-and-Mouth Disease, by G. Koller and F. Arndt (pp. 283–293); Hortega's Cells in the Inflammatory Reactions Complex of Borna Disease, by O. Seifried (pp. 294–306); Cystoscopy and Intravenous Pyelography in Domestic Animals, by S. Cliza (pp. 307–317); The Genus *Theileria* in Palestine, by W. L. Yakimoff (pp. 318–320); A Carcinoma in a Calf, by S. Sickmüller (pp. 321–329); Intratracheal Injections of Iodine Compounds in the Treatment of Protostrongyloidosis (Verminous Bronchial Pneumonia) of Sheep, by N. P. Orloff and L. K. Kuschina (pp. 330–335); Extension and Elasticity of the Large Flexor Tendons of the Horse's Foot, by W. Schreyer (pp. 336–340); Sterility in Its Relation to the Reactive Power of the Organism, by H. Wagner (pp. 341–351); The Usual Time Required for *Trichinella* Inspection, by Schmey, [F.] Voigt, and Conradi (pp. 352–367); The Pathology of Hog Cholera, by E. Eberbeck (pp. 371–400); Udder Infection and the Influence of Milking on the Course of Streptococcic Mastitis, by W. Ernst, F. Schmidt-Hoensdorf, and W. Schmidt (pp. 401–417); The Pyosepticemia of Foals, by B. M. Gurwitsch (pp. 418–435); The Multiple Calcareous Deposits in the Tissues of the Dog in Stuttgart's Disease, by W. S. Tscherniak and N. A. Romanov (pp. 436–458); A Case of Malignant Mastitis in a Cow Caused by *Streptococcus lanceolatus* Gamaleia, by E. Roots and J. Karlson (pp. 459–465); Borna Disease: A Reply to the Publication of Nicolau and Galloway [E.S.R., 65, p. 269], by W. Zwick (pp. 466–474); The Simulidae and Their Combat in the Leine River District of Hannover, by G. Enderlein (pp. 475–528); Serum-Virus Vaccination for Hog Cholera in Breeding and Feeding Herds, also a Contribution to the Hog Cholera Virus Carrier Problem, by J. Michalka (pp.

529–542); and Comparative Investigations of the Streptococci in Milk, including *Streptococcus epidemicus* (Davis), by W. Hergesell (pp. 543–560).

[Report of the contagious diseases and pathological divisions] (*Canada Min. Agr. Rpt., 1931–32, pp. 87–91, 93–95*).—Brief reference is made to the progress of control and research work under way with infectious and parasitic diseases of livestock.

Live stock diseases report, No. 8, M. Henry (*N.S. Wales Dept. Agr., Live Stock Diseases Rpt., 8 (1931–32), pp. 13*).—This is a report on control work with infectious and parasitic diseases during the year ended June 30, 1932 (E.S.R., 68, p. 376).

Cumulative poisoning by squill derivatives and by ouabain, E. W. Wallace and H. B. Van Dyke (*Jour. Pharmacol. and Expt. Ther., 48 (1933), No. 4, pp. 430–444*).—In the course of the work reported, cumulation experiments were performed with ouabain, one tincture of digitalis, and four derivatives of squill (two crystalline, two amorphous), the dog being used in most of the work. "Scillonin, a crystalline derivative of squill, was found to be less than half as potent a cumulative poison as ouabain and probably less than one third as potent in its cumulative effects as the other drugs used. The acute toxic effects of scillonin in the mammal (continuous intravenous infusion) were as great as those of ouabain (lethal dose about 0.1 mg per kilogram). In the frog it was relatively the least toxic of the drugs used."

The systematic relationships of Actinobacillus, L. Thompson (*Jour. Bact., 26 (1933), No. 2, pp. 221–227*).—A report is made of a study of three strains of *A. lignièresi* isolated from cattle in the United States, two strains of *A. pseudomallei* received from abroad, and three strains of *A. mallei* (*whitmori*) obtained from laboratories in the United States.

The results of this study confirm the report of Stanton and Fletcher concerning the close relationship existing between *A. mallei* and *A. pseudomallei* (E.S.R., 53, p. 678). "It is also shown that *A. lignièresi* is related to the abovenamed organisms morphologically, culturally, and serologically. The generic name *Actinobacillus* has priority for this group of organisms and is recommended. It is also recommended that the genus *Actinobacillus* be removed from the family Actinomycetaceae and be placed in the family Mycobacteriaceae in place of genus *Pfeifferella*, which it supplants."

An acid-fast Actinomyces obtained from lesions resembling bovine tuberculosis, L. M. Bishop and R. Fenstermacher (*Cornell Vet., 23 (1933), No. 3, pp. 288–296, figs. 5*).—Contributing from the Minnesota Experiment Station, the authors describe a case of infection in a bovine due to *Actinomyces asteroides*.

Proof of the elimination of Brucella abortus in cow's milk [trans. title], O. Pröscholdt (*Deut. Tierärztl. Wchnschr., 40 (1932), No. 43, pp. 673–685; abs. in Bul. Hyg., 8 (1933), No. 2, pp. 155, 156*).—From the studies reported it is concluded that only 3 percent of cows with a serum titer of less than 1:100 eliminate *B. abortus* in the milk, and that 81 to 86.6 percent of milk eliminators give a positive whey reaction. Further analysis of the figures indicates that cows with a whey titer of 1:80 or over are almost certainly milk eliminators. A whey titer of 1:10 to 1:40 is less certain evidence of this, though it indicates the importance of careful and repeated examinations for the presence of *B. abortus* in the milk.

Comparisons made of 163 samples of milk yielded 145 positives by guinea pig inoculation and 131 positives by the direct culture method, the two methods agreeing in 64 percent of positive cases. The author therefore advises the guinea pig inoculation method only when the direct culture has failed. Of 208 cows in whose milk *B. abortus* was demonstrated, 145 had aborted and

63 had calved normally. Of the 145 aborting animals, 22 had aborted 366 to 730 days previously. This indicates that *B. abortus* may be discharged in the milk for a long time after abortion has occurred.

A list is given of 18 references to the literature.

The abstract is by G. S. Wilson.

A study of Bang abortion live germ vaccine in a beef herd, C. H. Kitselman (*Cornell Vet., 23 (1933), No. 3, pp. 309–311*).—This is a contribution from the Kansas Experiment Station reporting upon studies of the persistence of Bang infection in a commercial breeding herd of 50 cattle following the injection of the live germ vaccine, the details of which are presented in tabular form. The herd was handled under typical Kansas range conditions. The calving percentage for the study was 38, with the outcome of 18 percent of the pregnancies unknown. The abortion percentage was 14, with 28 percent of sterility and 2 percent of premature but living calves.

Studies on vaccines in infectious mastitis, C. S. Bryan (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 3, pp. 390–399, figs. 2*).—In the work conducted at the Michigan Experiment Station here reported, it was found that "vaccines of the autogenous type as well as lactovaccines were of value in treating and obtaining recovery from infectious mastitis, as evidenced by bacteriological examination of the milk and physical examination of the milk and udder. In the few cows which did not recover, a large amount of damage had been done to the udder before vaccination. The effectiveness of the vaccine seems to depend on the extent of disease and the response of the animal to the vaccination.

"The gentian violet or brilliant green lactovaccine may be prepared cheaply and very easily by the practitioner. The technic of preparation is outlined fully. A definite protection was afforded noninfected animals in an infected herd by both the autogenous vaccines and lactovaccines. Three weekly injections of vaccine were given to these noninfected animals. All animals of lactation age, both pregnant and nonpregnant, were vaccinated safely. The living-culture vaccines can be used with safety, since no localized infections in the udder resulted after vaccination."

Examination of milk for streptococci of mastitis, C. S. Bryan (*Amer. Jour. Pub. Health, 22 (1932), No. 7, pp. 749–751, figs. 4; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 42*).—This work was conducted with a view to finding a rapid and accurate method of collecting and culturing milk samples with a minimum number of workers required.

It is concluded that "elaborate precautions in collection of milk samples for streptococcus examination are not essential; simply wiping the udder and teats with an antiseptic moistened cloth is sufficient. Ten cc samples from each quarter or cow are representative. Greater ease and accuracy in interpretation of cultural results are possible at the same time quantitative results are obtained. Gentian violet liver infusion blood agar is a superior medium to use in culturing milk for streptococci. Brilliant green may be substituted for the gentian violet."

The identity of Streptococcus pyogenes (haemolyticus) with S. epidemicus Davis and its significance in milk hygiene [trans. title], M. Seelemann and A. Hadenfeldt (*Zentbl. Bakt.* [etc.], *1. Abt., Orig., 126 (1932), No. 3–4, pp. 231–240; abs. in Bul. Hyg., 8 (1933), No. 3, pp. 221, 222*).—In Germany the majority of cases of bovine mastitis are due to *S. agalactiae*, though a certain number have been described as due to *S. pyogenes*. An examination of German strains of *S. pyogenes* associated with mastitis and from the usual human diseases, in comparison with a series of *S. epidemicus* strains obtained from different foreign sources, led the authors to the conclusion, said to be shared by the majority of English workers, that they represent a single hemolytic form for which the name *S. pyogenes* holds by priority.

Some experiments in rinderpest vaccination: Active immunisation of Indian plains cattle by inoculation with goat-adapted virus alone in field conditions.—Second report, R. F. STIRLING (*Vet. Jour., 89 (1933), No. 7, pp. 290–306, pl. 1, figs. 3*).—This further contribution (E.S.R., 68, p. 91) reports upon vaccination work with cattle, including buffaloes, which up to June 1933 numbered 7,435 animals.

Trichomonas infections in cattle.—Preliminary report, H. S. CAMERON, M. G. FINCHER, and H. L. GILMAN (*Cornell Vet., 23 (1933), No. 3, pp. 297–303*).—The facts presented in this contribution indicate that trichomonads are an important factor in genital diseases of cattle. Recent accounts on the subject by Emmerson (E.S.R., 68, p. 530), Abelein (E.S.R., 69, p. 430), Riedmüller (E.S.R., 69, p. 713), and by McNutt et al. (E.S.R., 69, p. 713) have been noted.

A study of so-called skin lesions of tuberculin-reacting cattle, L. L. DAINES and H. AUSTIN (*Amer. Rev. Tuberc., 27 (1933), No. 6, pp. 600–610*).—In reporting upon their investigations in Utah, the authors point out that "whenever careful search is made of microscopic smears taken from skin lesions of tuberculin-reacting cattle and stained by the Ziehl-Neelsen method it is possible to find, from practically all lesions, acidfast and usually also nonacidfast organisms of different shapes and sizes. By using a modified moist Petroff's medium and adding a small amount of carbon dioxide, cultures may be obtained routinely from these lesions which are either acidfast from the beginning or which develop acidfastness on certain culture media. These cultures consist of pleomorphic, coccoid, diplococcoid, diphtheroid, or solid rod-shaped organisms. These various forms seem to represent different stages of a pleomorphic organism which may be obtained usually in pure culture. Because of these facts and also because of other evidence given, we think it is probably the cause of the lesions.

"Fairly characteristic skin lesions have been produced experimentally by injecting acidfast strains of these organisms into rats, white mice, and guinea pigs, while in cows typical lesions have resulted. Tuberculin tests in guinea pigs have been, for the most part, positive, while in cows the reaction is not constant, varying from negative to suspicious. This reminds one strikingly of results obtained in routine tuberculin-testing in the fields, where many skin-lesion cows will vary over a period of time between positive, suspicious, and negative reactions.

"Internal lesions produced in rats, white mice, guinea pigs, and cows resemble more nearly pseudotuberculosis of sheep produced by the Preisz-Nocard bacillus. Although in some animals there has been some orchitis, this has not been as strikingly typical as that produced by virulent Preisz-Nocard organisms. Organisms similar to the ones injected into the experimental animals have been consistently recovered in culture from the experimental lesions. Chickens have so far failed to respond in any way to the injection and feeding of the organisms. The identification of the organisms in question has not been made."

The authors consider this study to have given a considerable amount of evidence that the lesions are not due to *Mycobacterium tuberculosis* but rather to an undescribed species.

The account is presented in connection with a list of 19 references to the literature.

White scours of calves, L. Van Es (*Nebraska Sta. Circ., 46 (1933), pp. 12, figs. 2*).—This is a practical summary of information.

The campaign against liver flukes in California and the results, R. Jay (*Cornell Vet., 23 (1933), No. 3, pp. 272–279, fig. 1*).—In the campaign against liver flukes launched in 1928 and conducted cooperatively by the U.S. Department of Agriculture and the California officials, the plan of control consisted in the treatment of infected sheep and the destruction of snails which serve as intermediate hosts of the liver fluke (*Fasciola hepatica*). Carbon tetrachloride was used to destroy the mature flukes in the livers of the sheep and copper sulfate to destroy the snails in the infested areas.

During the first year about 300,000 doses of 1 cc of carbon tetrachloride were administered. The treatment proved to be very effective in ridding the sheep of the mature flukes, and the effect in arresting the death losses was immediate. In the field observations and experiments *Galba bulimoides*, the snail that has been found by Shaw and Simms to be the intermediate host in Oregon (E.S.R., 61, p. 856), was determined to be the one implicated. Copper sulfate, used to destroy the snail host, was found to be very effective, economical, and easy of application. On experimental test it was found that very even and economical distribution of the copper sulfate could be effected by reducing it to a dust, mixing it with a carrier, and dusting the mixture by airplane over large tracts. Although 1 part of copper sulfate to 1,000,000 parts of water will destroy the snails over night, a higher concentration was used to insure snail destruction.

It was found that where from 85 to 90 percent of the lambs from fluke-infested bands were sold as feeders, a similar percentage of lambs from the same bands after ridding them of flukes were marketed as fat lambs. The success of the campaign is said to have proved beyond question that the measures advocated are sound and practical.

A map is given showing the distribution of the liver fluke in California.

The transmission of louping-ill of sheep by ticks (Rhipicephalus appendiculatus), R. A. Alexander and W. O. Neitz (*Vet. Jour., 89 (1933), No. 7, pp. 320–323, figs. 2*).—The authors have found the tick *R. appendiculatus* capable of ingesting the virus of louping ill as larvae and transmitting it as nymphs. The virulence of the virus appears to be enhanced on passage through this tick. The presence of the virus is demonstrable in infected ticks before and immediately after engorging.

Observations on the treatment of trichostrongylosis in young sheep, H. G. Belschner and G. Edgar (*Aust. Vet. Jour., 9 (1933), No, 4, pp. 138–149*).—In the experiments conducted it was found that repeated treatments of young sheep with either copper sulfate and mustard, copper sulfate alone, or with carbon tetrachloride had no demonstrable effect on the small trichostrongyles. They also show that no benefit was obtained by a preliminary fast increased to 48 hours. The work is considered to demonstrate the need for reliance on good animal husbandry rather than medicinal treatment for control of small trichostrongyles of young sheep.

On the effect of the administration of sulphur to sheep, H. R. Seddon and W. E. Chamberlin (*Aust. Vet. Jour., 9 (1933), No. 4, pp. 154–159, fig. 1*).—The effect of the administration of sulfur on body weight and wool is considered by Seddon (pp. 154–158) and the effect on blood by Chamberlin (pp. 158, 159).

Sulfur did not show any material advantage over the control group either in body weight or in total or average fleece weights. From the standpoint of hemoglobin and red cell volume no advantage was obtained from the administration of 30 g of sulfur per week for 2 years.

Observations on the epizootology of Bang's disease in swine, J. N. McIlnay (*Cornell Vet., 23 (1933), No. 3, pp. 279–288*).—Field observations of the epizootology of infectious abortion of swine in Nebraska indicate that the disease is of considerable importance to swine owners. It was found in the investigation that "the ground used by aborting sows might be dangerous to bred gilts as a source of infection the season following the one when the ground was infected. All positive sows and gilts do not abort, but enough positive sows and gilts do abort that it does not pay to take the risk with such animals. It was found that ground not used for two years after abortions had taken place on this ground was safe for bred gilts. While not proved from an experimental standpoint in this investigation, observations in some herds make it appear that if it is impossible to provide clean ground for the gilts, the use of the old sows an extra season instead of gilts for breeding purposes will allow time enough for the infected ground to again be safe for gilts.

"Sows that have aborted once in a high proportion of the cases will farrow normal litters after rebreeding. A few herds which were affected were observed in which sterility was a problem following Bang's disease. An infected sow may farrow part of a litter normally and part of the litter dead. In some Bang's disease infected sows a severe respiratory disturbance was noticed for two or three days during which time the act of abortion took place. This respiratory disturbance was severe and appeared suddenly and in two or three days disappeared. Other herds displayed no clinical symptoms other than the act of abortion."

It is concluded that "the ideal time to place gilts on clean ground to avoid infection from the lots is at weaning time. These gilts should then remain on the clean ground until breeding time and then be bred by a negative boar and allowed to farrow on the clean ground. If they are placed back in the infected territory following breeding, there is every likelihood that they will become infected."

A paratyphoid epizootic on a large pig farm in 1932 [trans. title], **N. Sjöfält** (*Skand. Vet. Tidskr., 23 (1933), No. 6, pp. 320–331, figs. 2; Eng. abs., p. 331*).—This is a report of a study made of an outbreak of this disease on a large pig farm and the work conducted which resulted in its being eradicated from the herd in six weeks after its recognition. Good results were obtained from the use of a bacterin, all of the pigs having been treated.

Effectiveness of the swine sanitation system in the South, E. M. Nighbert and J. W. Connelly (*U.S. Dept. Agr., Tech. Bul. 374 (1933), pp. 15, figs. 7*).—This is a report of tests made in the South of the internal parasite control system developed in McLean County, Ill. (E.S.R., 58, p. 677), which has come into common use in the Middle West and attracted the attention of swine growers in other regions. Experimental work was conducted in Colquitt County, in southwestern Georgia, from 1926 through 1930 on 40 farms. The results indicate that this system, as modified for southern conditions, is effective in reducing materially customary losses in growing pigs. The modification consists in having the sows farrow on pasture rather than in permanent farrowing houses, and the washing of the sows before farrowing is not necessary in sections where the soil is sandy and well drained. The system is said to be moderately effective against other worm parasites, including kidney worms, which infest livers, kidneys, and loin tissues.

"A study of the records of all classes of cooperators using the swine sanitation system showed that on their farms there occurred a total of 772 farrowings, resulting in 5,006 pigs going to pasture, an average of 6.5 pigs per litter. Barring deaths from accident on pasture, only 273 pigs, or 5.5 percent, were lost, indicating that the system was 94.5 percent effective in protecting against losses of the kind the system was designed to prevent.

"On the farms of control-herd owners 197 farrowings occurred during the 4 years, resulting in 1,184 pigs turned to pasture, or an average of 6 pigs per litter. The losses on pasture from disease were 213, or 18 percent. Hence, on farms on which no attention was given to sanitation in raising pigs, only 82 percent of the pigs that were turned to pasture and that escaped accident were raised for market or kept for breeding.

"When losses from accident were included, the percentage of pigs saved or marketed, based on the number placed on pasture, was 90 percent for the sanitation pigs and 78.2 percent for the controls. The average daily gains of the experimental pigs were 0.63 lb. for the sanitation lots and 0.57 lb. for the controls. Post-mortem examination of the sanitation pigs slaughtered during the experiment showed that 75.2 percent of the livers were parasitized, whereas of the livers of control pigs 93.5 percent were parasitized. Kidney worm infestation of the sanitation pig carcasses was 31.8 percent, as compared with 49.7 percent in the controls. Examination of the viscera from the sanitary pigs showed 76.3 percent ascarid infestation, whereas in the control pigs there was 82.9 percent infestation. The numbers of different parasitic worms present in the experimental lots each year, as indicated by post-mortem examination, varied considerably. However, the number was small as compared with typical infestations of pigs kept in old hog lots.

"The effectiveness of the system when followed in detail is illustrated by the results obtained by the 'excellent' cooperator. During the 5 years his losses of pigs from disease alone were only 4.3 percent, as compared with 5.5 percent for all sanitation lots and 18 percent for the controls."

Equine encephalomyelitis, E. Records, L. R. Vawter, F. H. Baker, and G. T. Woodward (*Nevada Sta. Bul. 132 (1933), pp. 22, figs. 12*).—This account is based largely upon clinical, epidemiological, and experimental studies conducted at the station incident to epidemics of equine encephalomyelitis in the State in 1931 and 1932. The account is said to be primarily for veterinarians, no attempt having been made to outline a routine treatment that might be followed by stockmen.

It is pointed out that the satisfactory treatment of horses or mules afflicted with the disease requires skilled medical attention, varied to some extent on a basis of professional judgment to meet the needs of the individual case. Following a discussion of the history of the disease, the authors deal with its etiology, characterization, mode of transmission, clinical types and variations, clinical symptoms and course, differential diagnosis, treatment, immunity, and epidemiology, together with suggested preventive and control measures. A table gives the differential clinical symptoms and anatomical changes as compared with botulism, azoturia, and heat stroke. A list of 12 references to recent literature on the disease is included.

The life history of Gastrophilus larvae of the horse and lesions produced by the larvae, E. E. Wehr (*Cornell Vet., 23 (1933), No. 3, pp. 254–271*).—In addition to a review of the literature on the several species (*G. inermis*, *G. pecorum*, horse botfly, nose botfly, and throat botfly) presented in connection with a list of 22 references to the literature, the author reports upon experimental studies of the larvae of the horse botfly conducted during the summer of 1931, in which the path of its migration within the animal host is thought to have been worked out. In this work, which was commenced July 27, larvae of the horse botfly were fed daily except Sundays for a period of 85 days to a young colt of 3.5 to 4 months of age, a total of 12,920 larvae being fed. In a post-mortem examination of the animal on October 22, 713 larvae were found attached to the left side of the stomach, 1 other larva fixed to the mucous membrane of the esophagus, and still another larva lying unattached at the back of the tongue near the entrance to the pharynx; no larvae were found in the pharynx itself. A large number of small larvae were embedded in the mucous membrane of the tongue, lips, and cheeks.

The first molt evidently occurs just about the time the larvae escape from the mucous membrane of the tongue or soon after, as all the larvae extracted from the tongue were still in the first instar. The second molt takes place in the stomach. Nearly one half of the larvae taken from the stomach were still in the second instar, while the other half were in the third or last instar.

Glanders with special reference to bone lesions, T. Topacio (*Philippine Jour. Agr., 3 (1932), No. 4, pp. 281–287, pls. 2*).—A report is given of an obscure case of glanders in a grade pony, diagnosed with particular reference to the bone lesions. A critical description of the pathological lesions involving the right mandible is included.

Infectious anemia of the horse, L. Lamarre (*L'Anémie infectieuse du cheval. Paris: Vigot Bros., 1933, pp. VIII+270, pl. 1, figs. 16*).—This is a report of clinical and experimental investigations presented in connection with a bibliography of 21 pages.

Liver disease of horses (big liver) caused by the feeding of alsike clover, F. W. Schofield (*Ontario Dept. Agr. Circ. 52 (1933), pp. 4*).—This practical account of equine hypertrophic cirrhosis includes a brief report of two feeding experiments to illustrate the harmful effects caused by continuous feeding of alsike clover.

Equine trypanosomiasis, "murrina" or "derrengadera": Some notes on the disease in Panama, H. C. Clark, T. L. Casserly, and I. O. Gladish (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 3, pp. 358–389*).—This is a summary of information on the trypanosome disease of the horse in Panamá due to *Trypanosoma hippicum* of Darling (E.S.R., 23, p. 486), accounts of which by Clark and Dunn have been noted (E.S.R., 69, pp. 583, 712).

Pullet mortality, D. C. Kennard (*Poultry Sci., 12 (1933), No. 5, pp. 335, 336*).—This is an abstract of a contribution from the Ohio Experiment Station presented at the annual meeting of the Poultry Science Association in August 1933.

In a 12-year survey of the mortality of certain groups of pullets made at the station, in which tests no birds were removed as culls, the findings were as follows: "The principal causes of mortality, 1921 to 1928, were colds, roup, and bronchitis; whereas the primary causes from 1928 to 1933 were paralysis, leucosis, fowl typhoid, and cholera-like disease. The average yearly mortality of pullet layers, 1921–25, was 13.2 percent; 1925–29, 38.4 percent; and 1929–33, 55.5 percent. During the first 4 years, hens were, for the most part, used for breeders. From 1925 to 1932, pullets were largely used as breeders."

In the first of two tests made in 1931–32 with hens v. promiscuous pullet breeders, the first-year mortality of laying pullets from hens was 35 percent; from pullets, 60 percent. Paralysis in pullets from hens amounted to 12.5 percent; from pullets, 20 percent. In the second test, in 1932–33, the gross mortality in pullets from hens was 40 percent and from pullets 60 percent. There was 16 percent paralysis in pullets from hens and 30 percent in pullets from pullets.

In a comparison made of imported pullets from three different sources with the station's pullets, the mortality of imported pullets was decidedly less, and they were practically free of paralysis. The following year, however, when hatching eggs were secured from the same source, the mortality of these pullets as layers was 53.4 percent, due largely to paralysis. This indicated that the diseases causing the high mortality of the station's flocks were contracted, for the most part, during the brooding and growing periods, and that susceptible pullets not exposed to these diseases until after 5 months remained resistant or immune.

"A four-point program followed by the station proved successful in the rearing of ready-to-lay pullets in 1933. (1) Use of hens for breeders; that is, the survivals free of, or resistant to, the diseases which caused 40 to 60 percent of their sisters to die before the end of their pullet laying year. (2) Elimination of pullorum reactors. (3) Ample room for chicks and growing pullets (1 sq. ft. floor space per chick). (4) Henway brooding—heated hover with cool brooder room (40° to 60° when weather permitted). Results to 20 weeks of age: Mortality 8 percent, practically no paralysis. In contrast to this, during the 3 years preceding, there was heavy mortality of chicks and growing pullets; also paralysis appeared at an early date and was responsible for heavy losses among the growing pullets.

"In many instances it would seem that, temporarily, the simplest way to avoid the losses due to paralysis, leucosis, fowl typhoid, and cholera-like diseases would be to discontinue brooding and growth of pullets and instead to purchase pullets 5 to 6 months of age, which are supposed to be free of such complications. For a permanent solution of the problem, breeding, selection, and management to produce birds resistant or immune to such diseases seem most promising."

Mortality studies by Stafseth and Weisner at the Michigan Experiment Station have been noted (E.S.R., 65, p. 473).

Cross infection experiments with coccidia of birds, F. D. PATTERSON (*Cornell Vet., 23 (1933), No. 3, pp. 249–253*).—In cross-infection experiments with coccidia of the chicken, pheasant, and quail, *Eimeria tenella* failed to infect turkeys, ducks, pheasants, and quail. *E. mitis*, *E. acervulina*, and a mixed culture of *E. mitis* and *E. maxima* failed to infect quail. *E. phasiani* and *E. dispersa* failed to infect chickens.

The use of certain chemicals in the control of coccidiosis in chickens experimentally infected.—Preliminary note, E. A. ALLEN (*Poultry Sci., 12 (1933), No. 5, p. 324*).—This is an abstract of a paper presented at the annual meeting of the Poultry Science Association in August 1933.

In the experiments conducted, in which vinegar of several commercial brands was used, the acetic acid content ranging from 4 to 5 percent, it was found that in addition to reducing the mortality vinegar also decreased the amount of hemorrhage and apparently prevented the formation of a cheesy mass in the ceca of chickens infected with *Eimeria tenella*. The number of oocysts was considerably less in the cases receiving vinegar and, of those produced, a considerable percentage of the oocysts appeared unable to sporulate after being passed by the chicken.

In the experiments reported, drinking water which contained vinegar 1 part in 79 parts of water was given to chickens experimentally infected with pure strains of *E. tenella* and to others infected with mixed strains of coccidia, including *E. tenella*. In the first three experiments vinegar was given on five successive days, on the sixth day sodium bicarbonate was substituted for the vinegar in the same proportion, and on the seventh day vinegar was again resumed and was continued for about a week longer. Judging from the amount of hemorrhage and oocyst production, it was found that sodium bicarbonate was of no value and that zinc acetate was apparently harmful; therefore, only vinegar was used for treatment of chickens in the fourth experiment.

Studies on the viability of Eimeria tenella in soil, F. D. PATTERSON (*Cornell Vet., 23 (1933), No. 3. pp. 232–249, fig. 1*).—Tests were made of the viability of *E. tenella* under the different conditions here reported. The details are given in tabular form.

Soil with a 20 percent moisture content, allowed to evaporate without restoration and held at atmospheric temperature, failed to infect birds after 10 weeks. Soil saturated with moisture, restored when necessary and held at atmospheric temperature, soil with a 20 percent moisture content and refrigerated at 7° C., and soil saturated with moisture and refrigerated at 7° all caused infection of birds for 23 weeks, or the maximum period tested. Soil under natural conditions of weathering and shaded from direct sunlight caused infection of birds for 21 weeks, or the maximum period tested. Soil under natural conditions of weathering exposed to direct sunlight caused infection of birds for 10 weeks, the maximum period tested.

When the surface of soil in Petri dishes was exposed to direct sunlight infection of birds was caused after 9 hours' exposure. All infections resulting from material exposed for 7 hours and more were recognized only at autopsy. Apparently this indicates either that many oocysts had been destroyed or that attenuation of their virulence had occurred.

Soil with a 20 percent moisture content and either intermittently or continuously frozen, and soil with 10 percent lime all caused infection of birds for 12 weeks, or the maximum period tested. Feces drying in the absence of direct sunlight and feces decomposing in sealed flasks each failed to infect birds after 3 weeks. Ceca putrefying in sealed flasks failed to infect birds after 2 weeks.

Blood studies of fowls with various forms of lymphomatosis (fowl paralysis), E. P. JOHNSON and B. V. CONNER (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 3, pp. 325–343, figs. 6*).—This is a report of studies conducted at the Virginia Experiment Station, the details being presented in tabular form.

"In 14 birds of the 31 studied with symptoms of paralysis of the limbs but no gross lesions noticed on autopsy, budding of lymphocytes occurred. In 10 of the 14 studied with symptoms of paralysis of the limbs and lymphatic hyperplasia of visceral organs, budding of lymphocytes was marked. In only 3 of the 15 paralyzed birds with tumors found on autopsy was budding of lymphocytes noticed. Three of the 12 birds with iritis or gray eyes also had numerous budding lymphocytes."

Immunization of day-old chicks and poults against fowl pox, R. C. DUNN and R. M. SHERWOOD (*Poultry Sci., 12 (1933), No. 5, pp. 323, 324*).—This abstract of an article presented at the annual meeting of the Poultry Science Association in August 1933 relates to work an earlier account of which by Sherwood has been noted (E.S.R., 68, p. 819). The authors conclude that healthy and vigorous day-old chicks or poults can be safely and successfully vaccinated against fowl pox, using fowl pox virus vaccine without causing any apparent constitutional disturbance. The vaccine was prepared by using 1 part of powdered fowl pox scab and 250 parts of a diluent consisting of 40 percent glycerin and 60 percent 0.85 sterile saline solution.

A report of some investigations of infectious laryngotracheitis, C. A. BRANDLEY and L. D. BUSHNELL (*Poultry Sci., 12 (1933), No. 5, p. 323*).—This is an abstract of an article presented at the annual meeting of the Poultry Science Association held in August 1933 on the influence of various agencies and factors on the pathogenicity of the virus of the disease and on some of the possible sources and modes of infection.

"Negative results were obtained on duplicate tests to show the presence of an active virus on the surface of eggs from a flock containing carriers and from a flock with the infection. These tests were made in 5 to 12 hours after the eggs were laid. During this interval the eggs were stored at 20° to 25° C. (It has been found by subsequent tests that the virus, diluted 1 to 300, would live on eggshells for 12 hours at 25° and 5 hours at 38°.)

"Filtration of fresh and dried virus suspensions were regularly successful through Berkefeld V and N, but not with W filters, using nutrient broth and yeast extract as suspending vehicles. The loss of potency due to filtration was from 10 to 100 times. Filtered and unfiltered virus in 1 to 300 suspensions remained infective for 50 days at 8°.

"Immune serum from 'carrier' individuals subsequently treated with massive doses of virus neutralized 4 times its volume of a highly virulent (1-300) virus suspension and prevented the appearance of symptoms in susceptible birds inoculated as long as 44 hours previously with 10 infective doses of virus. The addition of testicular extract (the Rynal's factor) did not make the virus pathogenic for ducks, guinea fowl, pigeons, rats, or guinea pigs; nor did it increase the number of positive inoculations by the intravenous route in chickens. Serial passage of the virus through baby chicks did not alter the virulence for mature chickens."

Laboratory immunization experiments on infectious laryngotracheitis, C. S. Gibbs (*Poultry Sci., 12 (1933), No. 5, pp. 322, 323*).—This is an abstract of a contribution presented at the annual meeting of the Poultry Science Association in August 1933, which is based upon Bulletin 295 of the Massachusetts Experiment Station previously noted (E.S.R., 69, p. 862).

Vaccination against infectious laryngo-tracheitis.—A preliminary report, J. R. Beach (*Nulaid News, 11 (1933), No. 2, pp. 7, 8; also in U.S. Egg and Poultry Mag., 39 (1933), No. 8, pp. 30, 31, 58*).—This is a preliminary report of the progress of vaccination work in California for control of laryngotracheitis by the method devised by Beaudette and Hudson (E.S.R., 69, p. 279). The author considers it to be the most promising measure for laryngotracheitis control that has been discovered.

[Vaccination for control of laryngotracheitis], F. R. Beaudette (*New England Poultryman and Northeast. Breeder, 17 (1933), No. 1, pp. 14, 15*).—This contribution from the New Jersey Experiment Stations discusses the status of vaccination for control of laryngotracheitis in the fowl.

The diagnostic value of the rapid test with stained antigens vs. the tube agglutination test for pullorum disease, W. A. Higgins and C. H. Schroeder (*Poultry Sci., 12 (1933), No. 5, p. 323*).—In this abstract of an article presented at the annual meeting of the Poultry Science Association in August 1933 it is reported that "a very close but not quite complete agreement was attained between the results from the tube agglutination test as compared with the rapid, whole-blood test when using stained antigens supplied by the U.S. Department of Agriculture, the Michigan State College, and two commercial laboratories manufacturing the antigen under patent permit from the Bureau of Animal Industry. A third commercial antigen gave unsatisfactory results.

"Excepting the one lot of stained antigen which produced results at marked variance, the rapid, whole-blood test with stained antigen was of equal diagnostic value as the tube agglutination test for *S[almonella] pullorum.*"

A study of pullorum disease in baby chicks as shown by the effect of different temperatures in brooding, W. L. Mallman, J. M. Moore, and L. R. Arnold (*Poultry Sci., 12 (1933), No. 5, p. 323*).—This is an abstract of an article presented at the annual meeting of the Poultry Science Association in August 1933. In studies conducted it was found that different brooder temperatures influenced to a marked degree the mortality of infected and noninfected chicks.

The sensitivity of chickens to tuberculin following exposure to different varieties of acid-fast bacilli, W. H. Feldman (*Jour. Amer. Vet. Med.*

Assoc., *83* (*1933*), *No. 3*, *pp. 344–357*, *figs. 3*).—The author's studies led to the conclusion that "chickens, although not considered susceptible to infection by the bovine or human form of *Mycobacterium tuberculosis*, may become definitely sensitive to mammalian tuberculin and in some instances to avian tuberculin following exposure to these species of *Mycobacterium*. The sensitivity is transitory. A group relationship exists between the forms of *Mycobacterium* responsible for tuberculosis in warm-blooded animals and tuberculin prepared from the avian and mammalian bacilli of tuberculosis. Eight strains of acid-fast bacteria other than those responsible for tuberculosis in cattle, human beings, and chickens were of no significance in eliciting sensitization in chickens to either avian or mammalian tuberculin. As a prerequisite for the development of sensitivity to tuberculin, it seems essential for the animal to experience contact with a pathogenic form of *Mycobacterium*."

Sanitation and disinfectants on poultry plants, W. L. Chandler (*Abs. in Michigan Sta. Quart. Bul.*, *16* (*1933*), *No. 1*, *pp. 44*, *45*).—The importance of various arthropods in the transmission of poultry diseases in poultry plants is considered and methods for their control suggested. In a test of the comparative efficacy of various disinfectants in sterilizing small amounts of finely divided avian fecal matter, colloidal iodine was the only material which consistently penetrated small particles of fecal matter and killed embedded bacteria within one half hour.

The value of the halogens chlorine and iodine as disinfectants, W. L. Chandler (*Poultry Sci.*, *12* (*1933*), *No. 5*, *p. 325*).—This is an abstract of a contribution presented at the annual meeting of the Poultry Science Association in August 1933.

"A large number of disinfectants which readily kill fully exposed bacteria even in the presence of organic matter failed to kill bacteria embedded in fecal matter voided from chickens with diseased intestines, and also failed to kill coccidial oocysts. Both iodine and chlorine in a free state and unhampered by solvents or adsorbents were, however, found readily to sterilize fecal matter from diseased birds, and also to kill coccidial oocysts within two minutes. The practical application of free iodine as a disinfectant has, in the form of colloidal iodine (Chandler), been employed for several years. A method for the practical application of free chlorine as a disinfectant has not as yet been worked out."

The value of kamala as a tenicide for young turkeys, M. C. Hawn (*Jour. Amer. Vet. Med. Assoc.*, *83* (*1933*), *No. 3*, *pp. 400–404*).—In experimental work at the North Dakota Experiment Station, the details of which are presented in tabular form, kamala in doses of 0.25 to 5 grains did not prove to be either a safe teniacide for turkeys weighing from 2.5 to 28 oz. or an efficient anthelmintic for the removal of tapeworms in turkeys weighing from 2.5 to 80 oz.

Toxicity and deposition of thallium in certain game birds, P. A. Shaw (*Jour. Pharmacol. and Expt. Ther.*, *48* (*1933*), *No. 4*, *pp. 478–487*).—Studies conducted in California on quail, geese, and ducks indicate that these game birds may be fatally poisoned with 12, 15, and 30 mg per kilogram of thallium, respectively. "Analyses of various body tissues indicate a distribution of thallium throughout, the muscular tissues such as the gizzard, thigh, and breast acquiring concentrations of thallium greater than the administered concentration; the vital organs and bone absorb a concentration approximately equal to that administered, while fat retains practically no thallium. Analysis of the tissues of a goose dying 13 days after the administration of a dose of 20 mg per kilogram indicated that the various tissues still retained 33 to 71 percent of the administered concentration.

"Although the edible tissues retain a large percentage of the ingested thallium, there is little probability that secondary poisoning in man would result from eating thallium poisoned game birds, due to the quantity of such flesh that would be required to produce a toxic dose in man. Studies on the elimination of thallium in the urine of a dog indicated that 61.6 percent of the dosage was excreted in 36 days. The rate, however, had decreased so that a minimum of 80 days additional would be required for complete excretion even though no further decrease occurred."

AGRICULTURAL ENGINEERING

Pump irrigation investigations in Nebraska, E. E. Brackett and E. B. Lewis (*Nebraska Sta. Bul. 282 (1933), pp. 31, figs. 4*).—This bulletin discusses the problems confronting Nebraska farmers who are favorably situated for pump irrigation and presents data relating to the effects of improved construction, installation, and operation of the well and pumping plant and some of the better methods of using the water.

The experimental data indicate that rainfall varies from 15 to 30 in. annually in the pump irrigation districts of Nebraska. Pump irrigation as practiced in Nebraska results in from 15 to 66 bu. greater yield per acre for corn, from 75 to 378 bu. greater yield per acre for potatoes, and from 0.7 to 3.8 tons greater yield per acre for alfalfa. The supplemental water needs of ordinary Nebraska crops are from 6.5 to 12 in. A plentiful supply of underground water is found a few feet under the surface in several of the river valleys and good wells are obtained, especially in the Platte Valleys. Apparently the methods of construction affect the yield of wells, but data collected are not conclusive.

The circle of influence and cone of depression take general forms, but indications show that many influences tend to vary these forms. Cost of well and pump generally ranges between $750 and $1,000. Most of the pumps are the 6-in. size and the vertical type and irrigate a small acreage, averaging about 55 acres for a 6-in. pump. Very little fall or winter irrigation is practiced. Increase in the acreage per installation (and a reduction in the investment cost per acre) can be secured by changing the cropping program in such a way as to lengthen the period of pumping and include more acres. A few installations are found on ponds and streams. Most of the pumps are operated by the general-purpose tractor, which is used principally for other farm work.

Power costs have varied widely (from 2.9 to 30.2 c.) but have averaged from 6.7 to 9 c. per acre-foot per foot of lift. With attendant labor at the pump included, the cost has averaged 10 c. per acre-foot per foot of lift. The cost of applying water (expense on field ditches and for distributing water) has averaged $3.50 per acre-foot.

The economical lift, based on average farm crops and prices over the period from 1913 to 1931, is 50 ft. or less. Irrigation pumps are considered as equipment for emergency use by a large proportion of Nebraska owners. Best results are secured by those who operated their pumps as a definite and regular part of the yearly program.

Spray irrigation of fields [trans. title] (*Schr. Reichskurator. Tech. Landw., No. 38 (1933), pp. 177, figs. 77*).—This technical symposium on spray irrigation contains papers on The Status of Spray Irrigation Technic, by B. Victor (pp. 7–31); Investigations on Resistance to Flow in Asbestos-cement Pipe, by A. Lüdin (pp. 32–47); Uniformity of Water Distribution through Whirling Spray Nozzles, by T. Oehler (pp. 48–83); Investigations on the Influence of Natural and Artificial Rain on Moisture Conditions in a Loamy Sand Soil, by W. Freckmann and W. Brouwer (pp. 84–94); Investigations on Water Consumption and Requirements of Garden Crops, by A. Demnig (pp. 95–110); Water Absorption through the Leaves of Plants and its Importance in Spray Irrigation, by O. W. Kessler (pp. 111–118); Results of Several Years' Spray Irrigation Experiments on Permanent Pastures, by Tiemann and Müller (pp. 119–134); and Investigations on the Spraying of Municipal Sewage and Water on Light Sand Soil, by W. Freckmann, W. Brouwer, and H. Borchardt (pp. 155–177).

Forecasting water supply, G. D. Clyde (*Civ. Engin., 2 (1932), No. 10, pp. 610–614, figs. 8; abs. in Utah Sta. Circ. 102 (1933), pp. 7, 8*).—An account is given of the water supply forecasting procedure of the station on the basis of snow surveys in progress. Data are presented indicating the relationship between snow cover and run-off as influenced by various environmental factors.

The theory of water-logging of agricultural land, D. Homer and W. Gardner (*Utah Acad. Sci. Proc., 9 (1931–32), pp. 1–6, figs. 7; abs. in Utah Sta. Circ. 102 (1933), pp. 5, 6*).—An attempt is made to define the term water-logged on the basis of hydrostatic pressure in the soil. It is pointed out that even though the soil is completely saturated, if the hydrostatic pressure is less than atmospheric there would be no tendency for free water to stand in an open auger hole, and such a condition would not be designated as water-logged.

An application is made to the special case of water entering converging strata of gravel giving rise to water-logging of the surface soil.

Water movement and porosity of soil and their relation to soil cultivation [trans. title], W. v. Nitzsch (*Schr. Reichskurator. Tech. Landw., No. 41 (1933), pp. 97, figs. 46*).—This is a highly technical report of studies conducted at the University of Leipzig on the dynamic relationships between water and soil and on the direct numerical expression of size and character of soil voids as components of soil structure.

The results show that the movement of water in soil is primarily in the direction of the finest pores which are empty of water. The motive power for water movement is the result of an equalization of the dynamic relations between water and soil. The result of this phenomenon is a dynamically balanced distribution of water in the soil. Differences in the water content of soils in crumb structure do not result in complete equalization of the dynamic differences, because the crumb structure fixes the water firmly within itself. Such water moves to adjacent crumb structure only under certain favorable conditions.

The movement of free water occurs very rapidly in such a manner as to saturate uniformly the soil layers with which it comes in contact, this movement being more rapid in light than in heavy soil. The movement of capillary water is very slow and is the slowest in hygroscopically moist soil. Apparently gravity does not influence the movement of capillary water. The capillary rise of ground water into the mulched surface of a normal arable soil is practically impossible, but this condition can be corrected somewhat by rolling or subsoil packing. Tillage was found to increase the percentage of larger voids in soil and decrease that of the smaller ones. It was found that soils having an untouched natural structure showed the relatively greatest speed of water movement with the lowest potential and initial water content.

Public Roads [July 1933] (*U.S. Dept. Agr., Public Roads, 14 (1933), No. 5, pp. 73–92+[2], figs. 17*).—This number of this periodical contains the current status of Federal-aid road construction as of June 30, 1933, and the following articles: Cotton Mats for Curing Concrete (pp. 73–80, 92); and An Index of the Cost of Highway Construction, by J. L. Harrison (pp. 81–92).

Reinforced concrete designers' handbook, C. E. Reynolds (*London: Concrete Pubs. Ltd., [1932], pp. XIV+298, figs. 51*).—This is a reference book giving the essential data and methods for designing different types of concrete structures.

Part 1 relates to engineering design principles and contains chapters on reinforced concrete engineering; loads; horizontal pressure due to earth and contained materials; bending moment and shearing force; framed structures; foundations; retaining walls and containers; bridges, buildings, and other structures; concrete materials, mixes, and stresses; reinforcement; beams and slabs; shear resistance; columns; combined stresses; and specifications, quantities, and cost estimating. Part 2 gives tabular data and examples, and part 3 is a descriptive bibliography.

Heat transmission through building materials, F. B. Rowley and A. B. Algren (*Minn. Univ., Engin. Expt. Sta. Bul. 8 (1932), pp. [VII]+106, figs. 63*).—This is a summary of the more important features of a research program on heat transmission through building materials conducted in cooperation with the American Society of Heating and Ventilating Engineers. The main objects of this work were (1) to develop and build reliable apparatus for determining both the thermal conductivity of insulating materials and the over-all heat transmission coefficients of built-up wall constructions; (2) to determine the proper thermal coefficients for the surfaces of materials, for air space construction, and for the materials themselves for use in calculating over-all heat transmission coefficients of built-up wall constructions; (2) to determine the results obtained by tests and by calculations and to determine the accuracy of the over-all heat transmission coefficients obtained by calculation.

Types of testing apparatus are described and data given on surface conductance as affected by direction of wind and conductance of air spaces. It was found that the thermal resistance of an air space gradually increases as the thickness of the air space is increased, until a thickness of approximately 0.8 in. is reached. After this the resistance of the air space remains practically constant regardless of its thickness. It was also found that for all practical purposes the surface coefficient as obtained for air flow parallel to the surface may be used when calculating heat flow through built-up wall sections, or at most a reduction of 15 percent may be made.

Different types of wall sections have been built up and tested by the hot-box method to determine the over-all coefficient of thermal conductivity. About 80 of these tests are reported. This group includes frame, brick, tile, stone, concrete, cinder block, and several specially constructed walls. Both insulated and uninsulated walls were tested, and the thickness in some cases ran as high as 12 in.

The tests with frame walls showed that the insulating value of the wall is progressively increased as better insulating materials are used for outside sheathing or plaster base, and that the method of application of the insulating material, as well as its insulating value, has an appreciable effect upon the over-all heat-transmission coefficient of the wall.

With insulation impervious to air it was found that walls with the insulation flanged between the studs were more satisfactory than where the insulation was nailed to the outside of the studs. If an insulating material is applied between the studs of a frame wall in such a way as to divide the air space into two parts, each at least an inch or more thick, the insulating value of the air space has been doubled. To realize this additional insulation due to the air spaces, care must be taken to prevent the passage of air from one space to the other. This air may filter through the materials or it may pass around them at top and bottom if they are not properly sealed. When the insulation is not sealed, the warm air passes up on the inside of the wall, over the opening at the top of the insulation, and down on the outside, thus carrying the heat from the warm-air space to the cold-air space by convection currents and eliminating the effect of the insulation.

Tests with clay-tile walls showed that in general the efficiency of a tile wall is increased by breaking up the air spaces and by eliminating any direct paths or tile connections between the two surfaces of the wall. The greatest improvement seems to be possible by breaking up the direct path for heat flow.

Cinder concrete showed lower heat transmission than gravel concrete, and surface brick showed a much higher coefficient of conductivity than the common yellow-clay brick. It was found that in general the conductivity of fibrous insulating materials varies directly with density. For the same material with all other conditions equal, this variation is usually a straight line. Other factors, such as moisture, arrangement and character of the fiber, etc., may have a greater effect than density. Data also are presented on over-all heat-transmission coefficients determined by tests and by calculation for 19 different walls.

Service records of treated and untreated poles, R. M. Wirka (*Elect. World, 102 (1933), No. 4, pp. 116–121, figs. 3*).—In a contribution from the U.S.D.A. Forest Service, data from service records of untreated and butt-treated poles are presented and analyzed. They show that the serviceable life of poles is affected by such factors as changes in wire load, reconstruction and rerouting of lines, species, soil and climatic conditions, size, and treatment, if any.

Of the butt treatments under observation the hot-and-cold bath process with creosote has been found the most effective. The brush method is less effective than the hot-and-cold bath method, but its use may sometimes be permissible where it is impracticable to use a more thorough treatment. The extension of life resulting from brush treatments with a good preservative should generally be sufficient to more than pay for the cost of application. Two coats of a good preservative applied by brushing should generally be more effective than one.

Chestnut, Northern white cedar, and Western red cedar poles that were butt-treated with creosote by the hot-and-cold bath process are giving excellent service in the regions in which they are under test. Though the tops of the Western red cedar poles in southern California are being attacked by termites, they will give an average physical life of at least 25 years.

Lodgepole pine poles that were butt-creosoted by the hot-and-cold bath process are giving long service in regions where top decay is not a factor, for example, in the higher altitudes of the Rocky Mountain regions. Under more severe service conditions, lodgepole pine poles would need top treatment also if the maximum life is to be obtained from them.

Tests with the ponderosa pine and white fir poles that were butt-treated with creosote by the hot-and-cold bath process show that in the part of California where they are being used a top treatment also is necessary for maximum service.

While the data on treatments using Anaconda Wood Preservative (dust and granules) are not very comprehensive, they indicate that this material will not be so effective as the hot-and-cold bath treatment with creosote. Increasing the resin content in pole butts proved of little value in extending the life of the lodgepole pine poles. There appears to be no advantage in seasoning poles to be used untreated before setting them in line. The extension of life to be accomplished by a thorough preservative treatment is proportionately greater in poles of nondurable species than in poles of naturally durable species. Butt treatments should extend well above the ground line if decay-producing fungi are to be repelled in that area.

The beneficial effect of oxidation on the lubricating properties of oil, R. O. King (*Roy. Soc. [London], Proc., Ser. A, 139 (1933), No. A 838, pp. 447–459, pl. 1, figs. 3*).—Studies of the properties of lubricating oils under conditions promoting oxidation of the oils are reported, these being conducted at constant speed and load.

Friction was found to decrease as the temperature increased, and generally passed through a minimum value at a temperature somewhat less than that of seizure. Viscosity was observed to increase with oxidation, but the consequent increase of fluid friction was apparent at temperatures below 50° C. only, that is, when the fluid film was relatively thick. Friction at higher temperatures decreased with the progress of oxidation and seizing temperature rose. Thus after about 60 hours of oxidation, minimum friction diminished to 0.00045 and seizing temperature exceeded 300°. The oil in a state of partial combustion remained an effective lubricant, friction being less than ever recorded for fluid friction even with air as the lubricant. A safe region of high temperature lubrication was attained, and experiments with various oils showed that the extent of this region and the life of the oil depend on oxidation characteristics. Friction is due neither to viscosity nor to the action of the adsorbed layer. It is suggested that the active or polar molecules formed during the early stage of oxidation build up to an appreciable thickness on the adsorbed layer, and the friction observed is that on the surface of the built-up layer. The surface diminishes in rigidity in the direction of motion as the thickness of the boundary layer increases, and friction approaches zero as a surface of complete slip tends to be reached.

Experiences and results with technical improvements in the management of a farm [trans. title], T. Tröscher and H. Köhler, in collab. with T. Römer (*Schr. Reichskurator. Tech. Landw., No. 35 (1932), pp. 76, figs. 40*).—An account is given of 3 years' experiments with labor-saving equipment and readjustment of buildings on a 115-acre general farm in Germany. The replanning of buildings appeared to be especially profitable in saving of time and labor when handling hay, grain, and manure, and in the care of animals and dairy stock.

Power, labor, and machine costs in crop production, D. D. Smith and M. M. Jones (*Missouri Sta. Res. Bul. 197 (1933), pp. 48, figs. 28*).—This bulletin presents the results of cost studies made with the object to determine (1) the power, labor, and machine costs of producing common farm crops; (2) how and why these items of cost vary; and (3) how these causes of variation in cost factors may be used in the selection of the most economical amounts of power, labor, and machinery for a given set of conditions. Data for this study were secured from a survey of 66 Linn County farms in 1931.

The average annual cost of horse labor in 1930 was $67.31 for an average of 750 hours' work. The average hourly cost of horse labor in 1930 was 9 c., and varied from 20.3 to 5.4 c. Feed constituted about two thirds of the cost of horse labor. Thirty percent of the farms studied used both horse and tractor power. The average hourly cost of general-purpose 2-plow tractors in 1930 was 57 c. These tractors did an average of 436 hours of work per year. Tractors operated less than 340 hours in general had overhead costs greater than operating costs. The depreciation rate on tractors varied from 8 to 21 percent, depending on the amount of annual use. Total repairs throughout the life of a tractor averaged 24 percent of the first cost.

The average hourly cost of horse labor on the horse-powered farms was 13 percent higher than on the horse- and tractor-powered farms. Horse and tractor power were complementary and not competitive. On the average each tractor replaced four horses. The average yearly cost of farm machines was 13.4 percent of their cost when new. If interest is not considered, this cost is reduced to 10.4 percent. The maximum use of field machines on these farms was from 12 to 30 days per year.

The depreciation rates on machines which were used a very limited amount per year, which had few moving parts, and which were constructed mainly of iron and steel did not vary significantly with the amount of use per year. The average depreciation rate on farm machines was 4.8 percent. Machines used the maximum amounts per year had the lowest daily cost.

A group of farms using tractor power for all operations in producing corn, except planting and a part of the cultivations, required approximately one half the number of man hours per acre as those farms using single-bottom plows and 1-row cultivators. Power, labor, and machine costs per acre for producing oats were 46 percent higher where the oats were drilled than where sown broadcast. However, the yields when drilled were enough higher to give equal bushel costs. Power, labor, and machine costs per acre for producing wheat were 71 percent higher on those farms where the ground was plowed than on those farms where the wheat was drilled in disked cornstalk land. Power, labor, and machine costs amounted to 34 percent of the value of crops produced on these farms.

The horse- and tractor-powered farms were 61 percent larger than the horse-powered farms. The crop index was 100 on both horse-powered farms and horse- and tractor-powered farms. The larger farms, in general, made more efficient use of power, labor, and machinery than the smaller farms. For the type of agriculture and the equipment used on these farms, 80 adjusted crop acres per farm (approximately 115 crop acres) will give as high a return per man as a greater number of acres. For the type of equipment used on these farms, 4 or 5 available horse power per man (5 or 6 horses per farm of 115 crop acres) seem sufficient to give maximum returns per man.

Report of an inquiry into changes in quality values of farm machines, between 1910–14 and 1932, J. B. Davidson, G. W. McCuen, and R. U. Blasingame (*St. Joseph, Mich.: Amer. Soc. Agr. Engin., 1933, pp. 165, pls. 64, fig. 1*).—This report presents the record of the engineering development of 25 representative farm machines during the past 20 years. The inquiry on which the report is based was conducted by representatives of Iowa State College, Ohio State University, and Pennsylvania State College, at the request of the National Association of Farm Equipment Manufacturers, made at the suggestion of the U.S.D.A. Bureaus of Agricultural Economics and Agricultural Engineering.

The object of the inquiry was to appraise or evaluate the changes in design, material, or construction in farm machines made during the period 1910–14 to 1932 which in any way affect the value of the machines to the user in accomplishing the purpose or work for which they were designed. The machines made during the 5-year period 1910–14 were used as a base, or considered as having a quality value of 100.

A detailed examination was made of 25 machines of 1932 in comparison with similar machines of 1910–14 at the plants of three prominent farm-machinery manufacturers. In addition, chronological records of changes in machines, reports on elaborate and extended shop and field tests made to determine the results of these changes, and the findings and opinions of the engineers in question were secured, together with data bearing on the reduction in the demand from farmers for certain repair parts after changes were made. In order to evaluate more accurately the effect of changes in the life and performance of the machines considered, accelerated tests of wearing parts were made, and laboratory tests of many important typical parts, old and new, were conducted in the presence of the authors.

It was found that the claims of the industry as to substantial improvements in the quality values of agricultural implements since the 1910–14 period were supported by a solid foundation of fact. The increased efficiency, durability, economy of operation, and the like, of each type of machine were evaluated as follows, using the corresponding quality values in the 1910–14 machine as a base (100): Grain binder 170, cultivator 165, grain drill 140, farm engine (3-hp.) 200, disk harrow 190, peg-tooth harrow 130, spring-tooth harrow 140, hay loader 155, mower 170, corn picker 210, corn planter 155, tractor plow 190, gang plow 150, walking plow (1-horse) 140, walking plow (2-horse) 140, sulky rake 135, side-delivery rake and tedder 140, cream separator 145, corn sheller (power) 190, corn shelter (hand) 170, manure spreader 180, grain thresher 195, feed grinder 175, silage cutter (16-in. blade) 215, and spraying machine (2-nozzle) 175.

A marked improvement was found in the lubrication of agricultural implements. The introduction of pressure lubricant feeding and fittings, oil seals, and dust covers has been a great factor in reducing wear.

During the past 20 years materials used in the manufacture of farm implements have undergone many changes. The use of wood, chilled iron, and malleable iron, common in the pre-war period, has been greatly reduced. Iron and steel, brasses, bronzes, aluminum products, etc., in all their varied special use compositions are more widely used. Special characteristics in materials have been developed to withstand greater strains, to resist corrosion, to increase resistance to wear, or the like, for a given size or weight of part.

Steels formerly used have been superseded by a fine graduated series of well-controlled carbon and alloy steels. Many small parts have been changed to die-cast metals. Bronze and white metals have superseded the brasses and lead-bearing metals. Even within the regular carbon steels the earlier Bessemer process has been replaced by the open-hearth process in order to gain certain advantages in strength, controllability, and other desirable properties. Corrosion-resisting metals are being introduced wherever practical.

Heat treating, involving the installation of delicate heat-controlled equipment, has greatly increased the durability of many parts and made possible a product of uniform quality. Examples are heat-treated rake teeth, plow beams, bolts and cap screws, section knives, cultivator and plow disks, springs, chains, and numerous other parts which are now made of qualities not obtainable in the earlier period. The implement industry uses cleaner steel than formerly, with the result that there is now less failure from defective material.

The development of haymaking machinery, W. H. Cashmore and J. E. Newman (*Empire Jour. Expt. Agr., 1 (1933), No. 1, pp. 58–67, pls. 2*).—In this brief contribution from the Institute for Research in Agricultural Engineering of Oxford University, the development of the machinery used for haymaking is traced and an attempt is made to show how haymaking practice changed as new machinery made new methods possible. An account also is given of the motor car hay sweep and haystacker and of trials with the combine baler.

What determines the length of life of prepared roll roofings? H. Giese, H. J. Barre, and J. B. Davidson (*Iowa Sta. Bul. 304 (1933), pp. 25–39, figs. 9*).—This is a brief account of an investigation to determine the quality factors of 3-ply prepared roll roofing, a more detailed account of which has been presented (E.S.R., 68, p. 838).

Thermal conductivity and surface treatment of silo walls, H. Giese (*Iowa Sta. Bul. 303 (1933), pp. 22, figs. 14*).—The work reported in this bulletin deals with two problems in connection with the use of the silo. The first part relates to the thermal conductivity of the wall and its influence on the amount of frozen silage. The second part reports observations on a number of surface treatments which gave promise of rendering the wall airtight and watertight, and also of reducing the erosion of the wall due to the silage acids.

It was found that temperatures taken inside the north wall on concrete, hollow-block, and wooden-stave silos, follow outdoor temperatures rather closely and show little advantage in favor of any one material. Temperatures taken near the center of the silo are higher and fluctuate less than those near the wall surface. Under most conditions, silage itself is a good insulator. Much heat may be lost through open doors or out of the top of an unroofed silo. Exposure to cold winds is an important factor. Any of these or a combination of them may have more influence upon the amount of frozen silage than the construction of the wall.

All of the materials tested in connection with the study of wall surface treatments gave complete protection for a limited time only. Cement plaster gave the best protection in rendering a clay-block silo wall airtight, but considerable difficulty was experienced in securing a satisfactory bond with the tile.

Bituminous coatings proved satisfactory on tile silos and are easily applied. A high grade roofing cement containing asbestos fibers in asphalt will stay in place better than asphalt alone. At least the first coat of this cement should be thinned with gasoline to a consistency which will permit application with a brush and so that it may be used cold. Hot applications of asphalt chill quickly upon contact with the cold silo wall, harden at once, and fail to bond.

The apparent necessity for wall treatment on concrete-stave silos has been to stop, or at least retard, the corrosive action of silage acids. Several of the materials accomplished this purpose fairly well. Difficulty was experienced with all specimens due to the scaling of the original cement wash. For this reason, if the wall has been coated with a cement wash, treatment should be deferred until all traces of the original wash are gone.

The design and construction of masonry water supply tanks, H. Giese and J. B. Davidson (*Iowa Sta. Bul. 302 (1933), pp. 369–399, figs. 38*).—This is a technical account of experiments extending over approximately 20 years with elevated masonry water supply tanks for farms requiring the storage of large quantities of water. Engineering data are presented on the requirements of such tanks, together with principles governing their design and construction. The latter are applied to the design and construction of tanks which proved suitable for farm service.

It was found that the masonry silo provides a desirable support for an elevated water supply tank. Masonry tanks will, if properly designed and carefully constructed, give long and satisfactory service. Block tanks must be lined with a waterproofing material which is plastic and of sufficient thickness to remain intact, notwithstanding expansion and contraction of the walls. Considering low winter temperatures in Iowa, exposed tanks and supply pipes leading to them should be well insulated.

Evaporating, condensing, and cooling apparatus, E. Hausbrand, trans. by A. C. Wright, rev. and enl. by B. Heastie (*London: Ernest Benn, 1933, 5. Eng. ed., rev. and enl., pp. XXI+23–503, figs. 53*).—This is the fifth English edition of this handbook, which presents principles, formulas, and working data for use by engineers (E.S.R., 62, p. 174).

Ventilation studies in stalls, W. Jahn (*Ventilationsversuche in Ställen. Inaug. Diss., Tierhyg. Inst., Univ. München, 1931, pp. 35, figs. 2*).—This is a contribution from the Ludwig-Maximilian University in München. Following a brief discussion of the status of the knowledge of stable ventilation, an account is given of some studies conducted in a military stable housing 46 horses. Each horse occupied a stall space of 29.4 m^3 (1,038 cu. ft.) and a total average stable space of 36.1 m^3. A second test was conducted in a stable having 29.8 m^3 of space for each horse. Special attention was devoted to the influence of artificial ventilation equipment on temperature, humidity, ammonia content of the air, and the like, and their interrelations.

It was found that the carbon dioxide content of the stable air varies uniformly and regularly with the conditions of ventilation imposed. The ammonia content of the stable air varies irregularly according to the conditions of litter and manure removal. The stable temperature and the absolute humidity are strongly influenced by the same factors of the outside air. In this connection it was not possible to attribute any definitely favorable influence to any of the ventilation equipment tested. Horizontal wall pipes and roof ventilators had some favorable effect. The data are presented in detail, but no conclusions are drawn.

Ventilation of poultry houses for laying and breeding hens, J. C. Huttar, F. L. Fairbanks, and H. E. Botsford (*New York Cornell Sta. Bul. 558 (1933), pp. 48, figs. 33*).—The results of studies conducted during the 6-year period from 1925 to 1931 on poultry house ventilation are presented, together with a review of data from other sources.

Two 20 by 20 ft. pens were used in the studies, these being constructed as one long building with an 8 by 20 ft. observation and feed room between them. One pen was constructed according to the regular plans of the Cornell laying house, whereas the other differed in that it was insulated inside with Celotex, the center curtain openings were fitted with windows, and a Rutherford type ventilation system was installed. While egg production was good in both pens, it was much larger in the insulated pen. The 6-years'-average figures for the two pens showed no significant difference in the quantity of feed required to produce one dozen eggs.

Relative humidity, ranging from 40 to 95 percent but never remaining above 90 percent longer than 24 hours, seemed to have no effect on pen conditions or on the activity of the birds throughout this test. While health and mortality conditions were not so desirable as might be expected, there was no significant difference in these conditions between the two pens. Practically no difference was found in the hatchability of the eggs from the two pens except for the first year, when the more open pen gave the best results.

For winter conditions as found in central New York, the litter does not become damp if not more than 150 birds are placed in a pen of similar construction to that of either pen in this experiment, provided the ventilation is also similar. More than 150 birds in a 20 by 20 ft. pen seemed to cause damp litter in the winter. Neither pen was excessively drafty when the front was open, unless a very strong wind was blowing from a southerly direction. The rate of air movement through either pen, when closed on cold days, was strongly influenced by the rate of air movement outdoors and the direction of the wind. A south wind induced the most rapid air movement through the pen. There seems to be little or no relation between the difference in temperature between indoors and out and the rate of air movement through the pen, for differences not exceeding 18° F.

The data obtained in this test indicate that the regular Cornell laying house is satisfactory for central New York conditions to house Single Comb White Leghorn pullets. While the insulated pen with the commercial ventilation system gave as good or very slightly better results than the regular Cornell house, the difference was not sufficient to warrant the added expense of insulation and the installation of the ventilation system used.

The curtains in the front of the Cornell laying house should be closed when the temperature drops below 15° outdoors or whenever a strong wind or storm is blowing in. The front rafter ventilator should be constructed so that there is a 1-in. opening along the entire length of the house when the door is closed.

This is to permit the air to flow out of the house at all times and to prevent the wind and storm from blowing into the house. This front rafter-ventilator door may be left open at all times except when strong winds are blowing against the front of the house, or, if the operator desires, at temperatures below 15°.

The importance of ammonia in the fixation of chlorine by water [trans. title], M. L. Koschkin (*Ztschr. Hyg. u. Infektionskrank., 115 (1933), No. 1, pp. 99–109*).—Studies on the mechanism of the action of chlorine in water purification with preliminary treatment with ammonia are reported.

Pretreatment of water with ammonia reduced the chlorine-fixing power of the water and increased the bactericidal action of the chlorine. The amount of chlorine necessary for treatment also was reduced. It appears that the reduction in the chlorine-fixing properties of water by pretreatment with ammonia is due to the combination of the ammonia with substances in the water which otherwise would combine with and fix the chlorine and render it inactive as a purifying agent.

The present status of natural sewage purification (land treatment) [trans. title], H. Kohlschütter (*Kleine Mitt. Mitglieder Ver. Wasser, Boden u. Lufthyg., 8 (1932), No. 12–14, pp. 289–307, figs. 6*).—A review is given of the present status of sewage purification practices, involving land treatment through underground tile absorption systems, intermittent soil filtration, and soil spraying.

AGRICULTURAL ECONOMICS

Economic trends affecting agriculture, L. H. Bean and A. P. Chew (*U.S. Dept.Agr., 1933, pp. II+46, figs. 27*).—"This compilation of charts and tables, which is intended primarily for agricultural extension workers, shows some of the forces that have recently shaped the course of American agriculture. It is not comprehensive or exhaustive. It deals not with specific farm commodities but with selected facts that touch all branches of agriculture. It is a mere outline. A full account would require volumes. Many readers will doubtless want more details, particularly details for 1933, which they may obtain from the United States Department of Agriculture.

"The data are grouped broadly so as to emphasize: First, the relation of the domestic industrial depression to agriculture; second, certain world influences on American agriculture; and third, some of the resulting maladjustments in incomes and prices."

The agricultural situation in 1931–32 (*Roma: Internatl. Inst. Agr., 1933, pp. VIII+536*).—This is an economic commentary on the International Yearbook of Agricultural Statistics previously noted (E.S.R., 69, p. 458). The several chapters discuss the course of the agricultural depression in 1931–32; summarize the position and tendencies of the international market for certain products of capital importance, examining on broad lines the conditions of supply and demand and the movement of prices; describe briefly, by countries, the principal government measures for farm relief and the action taken by voluntary associations in the interests of producers; and discuss, by countries, the economic conditions of agriculture.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta Bimo. Bul. 164 (1933), pp. 133–136*).—Included are the following articles and tables:

Life insurance companies have large land holdings, F. L. Morison (p. 133).—This is a brief statement of the extent and location of holdings by life insurance companies of farm land taken on foreclosures.

Ohio wheat acreage and production, J. I. Falconer (pp. 134, 135).—A table, compiled in cooperation with the U.S.D.A. Bureau of Agricultural Economics, shows, by counties, the number of farms growing wheat in 1929 and the 5-year averages, 1928–32, of acres seeded and harvested, total production, and average yield per acre seeded and per acre harvested.

Index numbers of production, prices, and income, J. I. Falconer (p. 136).—The table previously noted (E.S.R., 69, p. 880) is brought down through June 1933.

Current farm economics, Oklahoma [August 1933] (*Oklahoma Sta., Cur. Farm Econ., 6 (1933), No. 4, pp. 85–107, figs. 5*).—Included are articles on the general agricultural situation and the wheat situation, by L. S. Ellis; on the agricultural adjustment plan as applied to wheat and the beef cattle and hog situations, by P. Nelson; on farm management aspects of the wheat program, the dairy situation, and causes for the recent rise in prices, by P. H. Stephens; and on the business operations of Oklahoma farmers' elevators in 1930 and 1931, by R. A. Ballinger.

Taxation of agriculture in North Carolina, G. W. Forster and M. C. Leager (*North Carolina Sta. Tech. Bul. 43 (1933), pp. 56, figs. 7*).—"For the first time an attempt has been made to determine the aggregate taxes paid by farmers in the State for the period from 1920 to 1931, inclusive, to compare this aggregate year by year with the total taxes levied by the State and municipalities and to relate the proportion of total taxes levied on agriculture to the proportion of the total State wealth held and income received by farmers. To determine the tax burden, it was necessary to calculate (1) the gross cash income received by farmers, and (2) the gross cash expenses."

Using chiefly publications and data of the U.S. Bureau of the Census, the U.S. Department of Agriculture, the division of crop estimates of the North Carolina Department of Agriculture, the tax commission of North Carolina, and the North Carolina Experiment Station, estimates are made, by years 1920–31, (1) of the total and agricultural wealth, income, and taxes of the State; (2) of gross cash income for the State and from agriculture; (3) of estimated cash expenses of agriculture; and (4) of net cash income of agriculture and of landowners. Maps are also included showing, by counties, the percentage of net cash income taken by taxes levied in 1929 and the percentage of the 1929 property taxes delinquent in 1930. Appendixes describe the methods used in determining total wealth, agricultural wealth, and taxation; in calculating farm income and expenses and cropper's share of crop sales and expenses of production; and in obtaining operator's wage and unpaid family labor and county income and tax delinquency data.

From 1920 to 1931 total State wealth declined 41.6 percent, agricultural wealth 36 percent, total income for the State 30.35 percent, and gross agricultural income 66 percent. Farm wealth constituted 19.4 percent of the total wealth in 1920 and 21.3 percent in 1931, the range for the period being from 19.4 to 25.5 percent. Agricultural income decreased from 38.61 percent of the total income of the State in 1920 to 18.83 percent in 1931. Agricultural taxes decreased from 27.63 percent of the selected taxes for the State (gross taxes collected less poll tax, license tax, dog tax, amounts collected for highway fund, taxes collected by cities and towns for purposes other than schools, and taxes for special charter schools) to 17.57 percent in 1931. Farm taxes were 2.5 percent of the cash income for agriculture before paying taxes in 1920 and 10.9 percent in 1931, the average for the period 1920–31 being 6 percent. In the case of landowners, the percentages were 3.2 in 1930 and 14.6 in 1931 and the average for the period was 7.7.

In 1930 in 31 counties 20 percent or less of the 1929 tax levy was delinquent, in 31 counties from 20 to 40 percent, in 17 counties from 40 to 60 percent, and in 11 counties from 60 to 100 percent. Delinquency, however, was not found to be highly correlated with ability to pay.

Mortgage loans on farm real estate in Clark County, South Dakota, 1910–1930, G. LUNDY (*South Dakota Sta. Circ. 10* (*1933*), *pp. 55, figs. 17*).—This circular sets forth factual information regarding the mortgage situation in 3 townships of the county each 5 years 1910–30. The data were obtained from the records of the register of deeds of the county. The records were traced back for a sufficient number of years to assure a complete list of recorded documents affecting deeds and mortgages in force from 1910 to 1930, inclusive.

Tables and charts show for 1910, 1915, 1920, 1925, and 1930, or for 5-year periods ending with these years, data, usually for both first and second mortgages, regarding the amount of mortgage indebtedness, acreage mortgaged, average debt per acre, foreclosures, delinquent loans, relation of debts and prices, source of funds, cost of funds, term of and interest rates on loans from different sources, amounts loaned per acre by different agencies, land values and ratio of debt to value, and the relation of land purchases to indebtedness.

The data showed the following indexes, respectively, for 1915, 1920, 1925, and 1930 (1910=100): Total farm-mortgage indebtedness 130, 267, 274, and 222; acreage mortgaged 117, 135, 132, and 132; and debt per acre mortgaged 111, 198, 208, and 168. Foreclosures in the periods 1911–15 and 1916–20 amounted to less than 1 percent of the loans in force at the beginning of the respective periods. For the period 1921–25 unredeemed foreclosures were 10.9 percent of the 1920 indebtedness, and for the period 1926–30, 11.6 percent of the 1925 indebtedness. Delinquencies equaled 5.4 percent of the total indebtedness in 1910, 15 percent in 1915, 8.5 percent in 1920, 17.7 percent in 1925, and 28.2 percent in 1930.

In 1910, 62.8 percent of the first-mortgage funds had come from individuals and 13.3 percent from insurance companies. In 1930, 13.6 percent came from individuals, 54 percent from insurance companies, and 13 percent from the Federal Land Bank. For second-mortgage funds, the two almost equally important chief sources were individuals and commercial banks.

In 1910, 1915, and 1920, 6 percent was the predominating rate of interest on current first-mortgage loans. In 1925, 5 percent was the most common rate, and in 1930 almost 50 percent of the loans specified 5.5 percent and almost 50 percent were equally divided between 5 and 6 percent. For all the years studied, 5 years was the prevailing length of term for first mortgages. Comparing lands sold during the period and those not sold, it was found that in the case of the former almost twice as high a percentage was mortgaged, and the indebtedness per acre was also higher.

Labor requirements for Pennsylvania farms, J. E. MCCORD and C. E. CRONEMEYER (*Pennsylvania Sta. Bul. 292* (*1933*), *pp. 24, figs. 5*).—Analysis is made of data regarding the more important crop and livestock enterprises obtained from records kept in 4 sections of the State by 46 farmers in 1928 and 25 and 19, respectively, of the same farmers in 1929 and 1930.

Tables show (1) the average man, horse, truck, and tractor hours per acre used in producing and in marketing different crops and devoted per animal to livestock; (2) the average man and horse labor hours per acre used each year in each section in producing corn for silage and for grain, oats, wheat, potatoes, tobacco, alfalfa, and mixed hay; (3) the average number of man and horse hours per acre (also tractor hours for corn) used for different jobs in the different sections for corn, wheat, and potatoes, and the average man hours per job per head for cows and per 100 head for poultry; and (4) the monthly distribution per farm, by sections, of man, horse, and tractor hours, and the distribution, by 10-day periods, of the man, horse, and tractor hours per acre on different crops and of man labor per cow and per 100 birds.

Charts show for potatoes, tobacco, cows, and poultry the distribution, by 10-day periods, of man labor, total and for different jobs.

Cost accounts on New York farms, J. F. Harriott and L. M. Vaughan (*New York Cornell Sta. Bul. 554 (1933), pp. 67, fig. 1*).—Data from cost accounts for the years 1927–30, together with some data from earlier publications and studies to show changes in costs, returns, and labor requirements, are summarized for dry beans, cabbage, potatoes, canning factory peas and sweet corn, string beans, cucumbers, tomatoes, apples, cherries, peaches, pears, barley, buckwheat, corn, oats, mixed spring grains, wheat, grain for feed, bedding, and nurse crop, different kinds of hay, corn silage, dairy cows, hens, chicks, sheep, feeder lambs, and hogs. In general, three types of tables are included for each crop showing the following data: (1) For each year 1927–30 the growing, harvesting, and storing and selling costs, total cost, and returns per acre; (2) by years and periods 1914–31 the number of accounts, average acres per farm, average cost, returns, and profit or loss per acre and per ton or bushel, man hours per acre, and returns per hour of man labor; and (3) the relation, 1927–30, of acreage and yield per acre to costs and returns. For the different kinds of livestock and poultry, tables show the costs and returns, by items, for each year 1927–30, the averages from the accounts for longer periods for dairy cows and hens, and the relation of milk production per cow and size of dairy to costs and returns, 1927–30.

Other tables show for 1930 for 68 farms, by items, the average costs per farm of maintaining farm dwellings, other farm buildings, and crop land, and other data and costs by items of keeping farm horses each year 1927–30, and the averages from accounts with farm work horses, by years 1914–31.

Planning farm organizations for the northeast cut-over section of Minnesota, G. A. Pond and C. W. Crickman (*Minnesota Sta. Bul. 295 (1933), pp. 104, figs. 30*).—The agriculture of the area was studied during 1925–27 in cooperation with the Bureau of Agricultural Economics, U.S.D.A. A detailed study was made of the organization and operation of a group of representative farms in the Askov community of Pine County. The topography, soils, climate, crops, crop yields, transportation, markets, agricultural development, and present organization of farms are described. The problems of land development, maintenance of soil fertility, credit conditions, sparcity of settlement, and tax burden are discussed.

Using the data obtained from the Pine County farms, tables are given showing for different crops the average and standard (approximately the accomplishment of the upper 25 percent of the farmers in the scale of labor efficiency) amounts of man and horse labor and materials used in different operations on different crops and the yields of the crops, and the feed, man labor, horse work, and materials used for the production of different kinds of livestock and poultry. Charts show the weekly distribution of labor used for different purposes and the distribution per farm, by 4-week periods, of all man labor and all horse work.

The factors affecting the selection of crops and livestock and the planning of the farm organization are discussed. The application of systematic farm planning through the use of the budget method is described and illustrated.

A study of the organization and management of early potato farms in eastern Virginia, C. W. Crickman, H. T. Wingate, and J. J. Vernon (*Virginia Sta. Bul. 289 (1933), pp. 127, figs. 23*).—This bulletin reports primarily the results of the farm organization and management phases of a field study made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., of the agriculture of the Eastern Shore and Norfolk sections of Virginia. The field study included the farm business surveys of 169 farms in 1928, of 387 in 1929, and supervised accounts of the farm business of 71 farms during 1930. Detailed costs of production records for leading crops were obtained in 1930. "The survey records are analyzed to determine the kind of farming which was most profitable under the conditions prevailing during the period of the study, and for obtaining an indication of the cropping and livestock systems and management practices which promise to be favorable to highest earnings in the future. The detailed cost records are the basis for suggestions on methods by which the cost of potato production can be adjusted so as to secure the most economical production, considering prospective prices."

The climate, topography, soils, adaptation of crops, transportation, and markets of the area are described, and the agricultural development of the present organization of farms in the area and the economic conditions existing in 1928, 1929, and 1930, are discussed.

Analysis, with numerous tables and charts, is made of the relations in 1928 and 1929 of the 6 factors—size of business, degree of specialization in potatoes, income from livestock, number of cash enterprises, crop yields, and productive man work units per man—to labor income. A table also shows the average labor income on the farms grouped according to the ratio of gross receipts to capital invested. The average labor income of the 387 farms for which records were obtained in 1929 was $1,078. The 1 farm which was above the average in all the 6 factors had a labor income of $7,955. The 15 farms which were above the average in 5 factors had an average labor income of $4,568, and the 64 farms which were above in 4 factors had an average labor income of $2,306. Ninety-seven farms exceeded the average in 3 factors and had an average labor income of $1,084. One hundred and fifteen farms were above the average in 2 factors and had an average labor income of $471, while the 76 farms which were above in only 1 factor had a labor income of $469. The 19 farms below the average in all factors had an average labor income of —$103.

The practices in growing and harvesting potatoes are described, and tables are given showing the operations, crew, power, hours of work, and cost of production per acre on the farms in different sections of the area studied. The effects of kind of seed, cost of man labor, and yield per acre on cost and returns per acre, and of length of growing season, rates of fertilizer application, hours of labor used per acre, kind of seed planted, and acres of potatoes per farm on yields per acre are analyzed.

Some data are given for sweetpotatoes regarding growing and harvesting practices, operations, crew, power, cost of production, and returns.

The possibilities for expanding hog, dairy, sheep, and poultry production in the area are discussed. The present situation in the early potato production areas of the United States is discussed, and some readjustments are suggested.

Facts on fruit and vegetable farming in New Jersey, 1926–1931, A. G. Waller and J. W. Carncross (*New Jersey Stas. Bul. 555 (1933), pp. 67, figs. 6*).—This bulletin sets forth some of the findings of studies made in Burlington and Monmouth Counties. The facts for Burlington County were obtained from a farm business study including the years 1926–31 and covering the area from the production, expense, income, and cost standpoint. Tables, charts, and text cover among other things land utilization; amount of livestock kept; relation of size of business to total receipts and farm income; relation of type of farm and labor income; fluctuation of income on fruit and vegetable farms; average yields and prices of different fruits and vegetables, by years 1926–31, on the farms surveyed; fruit yields and prices, by varieties, for apples and peaches; costs of production per acre, by items, for apples, 1930 and 1931, and the average labor requirements per acre for different operations; costs of production and labor requirements per acre, 1931, for peaches; costs of producing strawberries, sweet corn, can-house tomatoes, peas, and lima beans; cost of operation for tractors, trucks, and disk harrows; and the cost of applying spray material to apple orchards.

Based on data obtained from growers in Monmouth County for each year, 1929–31, tables are given and discussed showing for that county for apples the costs of production by items, yields and prices by varieties, labor requirements per acre by operations, etc.

Trends in cherry production in Michigan, G. N. Motts, C. A. Scholl, and J. W. Chapin (*Michigan Sta. Spec. Bul. 237 (1933), pp. 44, figs. 9*).—Data are given regarding the trends in the number of trees and production of sour cherries in the United States, in Michigan, and in the 11 commercial cherry-growing counties of Michigan. The development of the industry in the State, cultural practices, and the factors influencing the localization of the industry in the State are described. The present status of the industry in each of the 11 counties and the future potential production in the State are discussed with tables showing data regarding bearing and nonbearing trees, production, number and size of orchards, etc. Some data regarding number of trees, production, and future possibilities, etc., of sweet cherries in the State are also given.

Approximately 90 percent of the sour-cherry pack of the United States is produced in Michigan, New York, Wisconsin, Pennsylvania, Ohio, and Colorado, and nearly 50 percent of this amount is now produced in Michigan. The number of sour-cherry trees in the State increased from 1,300,800 in 1909 to 2,181,700 in 1929, of which 1,910,104 were in commercial orchards in the 11 counties. From 85 to 90 percent of the crop in the 11 counties is processed, and most of the remainder sold as fresh fruit. The present number of nonbearing trees in the 11 counties indicates that by 1936 there will be 46 percent more bearing trees in commercial orchards than in 1930, and that the potential pack will be approximately 60,000,000 lb., or 36,000,000 lb. with the more usual 60 percent crop.

The authors conclude that "any increase in the sour cherry plantings in Michigan should be made more with a view to the future market outlets at profitable prices than because additional land suitable for cherry production is available for planting. If and when general economic conditions and the development of the cherry industry warrant additional plantings, such plantings should be made only in the most favorable sites within the established commercial areas, as indicated in this study, and on the soils most suited to cherries where the production costs per pound will be low."

The number of sweet-cherry trees in the State was found to be approximately 125,000. Because of the cultural and environmental requirements of sweet cherries and the less dependable returns under Michigan conditions, it appears that in general sweet cherries should be used as a supplementary crop, rather than a major enterprise, in the State.

Dairy costs and returns in Michigan in 1932, K. T. Wright (*Michigan Sta. Quart. Bul., 16 (1933), No. 1, pp. 8–13, fig. 1*).—Data obtained in the first year of a dairy cost study are analyzed, and tables are included showing (1) for 44 dairy herds from which fluid milk was sold and 20 herds from which cream was sold, the average charges and credits, by items, and the amount of different feeds used per cow, per 100 lb. of milk, and per pound of butterfat; (2) for all the herds and the two types of herds, the average losses, labor returns, milk and butterfat production, butterfat test, and man hours used per cow; and (3) average costs and credits, by items, in keeping a bull.

A preliminary study of Indiana dairying from the standpoint of marketing, R. D. Canan (*Indiana Sta. Bul. 382* (*1933*), *pp. 16, figs. 2*).—Some of the results of a survey made to determine the fundamental facts relative to the production and marketing of Indiana dairy products are included. Four districts (835 farms) were surveyed, the chief market outlet being market milk and cream for buttermaking in one, condenseries in a second, market milk for Chicago in a third, and creameries buying for buttermaking in the fourth. In analyzing the data the farms were grouped into four groups on the basis of number of cows.

Tables included show, by districts or groups or both, data as to farm ownership, size of farms, status of operator, cow population, quality of product produced, number of buying agencies, seasonal production, method of disposal of product, frequency of marketing, equipment for cooling, feeds fed, etc.

The average number of cows kept per farm was less than 5, that on 51.7 percent of the farms being 5 or less. The survey showed a large seasonal variation in milk production, need for improvement in the quality of milk and cream, a large amount of duplication of services by transportation and buying agencies, and a decided lack of purchasing on a grade basis. Few farms outside the whole milk districts cooled their product, and cream for buttermaking was not marketed as frequently as it should be. The milk production areas supplying dairy plants were too large for efficient marketing of the raw product.

Cooperation in agriculture: Livestock marketing, P. L. Miller and G. Shepherd (*Iowa Sta. Bul. 306* (*1933*), *pp. 73–95, figs. 4*).—"This bulletin deals briefly with the important purpose of cooperative marketing in agricultural agencies as exemplified in the marketing of livestock, particularly hogs."

The changes and their effect in the livestock marketing system during the World War are described. The problems of the livestock sellers, including price disparities due to irregular daily fluctuations and seasonal changes in price relationships, grading and sorting for selling, and timing shipments, the reasons why farmers cannot meet these problems individually, and the most important goals of cooperative marketing are discussed.

Honey marketing in California, E. C. Voorhies, F. E. Todd, and J. K. Galbraith (*California Sta. Bul. 554* (*1933*), *pp. 31, fig. 1*).—This bulletin is based on a survey undertaken in 1931–32 in cooperation with the Pacific Coast Bee Culture Field Laboratory of the Bureau of Entomology, U.S.D.A. The general situation in the industry, marketing channels, and the outlets for honey in the manufacture of other food products are described. Using data gathered from 179 retail stores trade brands, kinds of containers used and their sizes and shapes, the distribution of comb honey, sirup as a competing commodity, the economic effects of the present methods of marketing honey, and the characteristics of consumer demand are discussed.

The adoption of grades, standardization of containers, improvements in mode of sale, and the organization of honey producers for sale of their product are measures recommended for improving honey marketing.

Prices of farm products in Maine, C. H. Merchant (*Maine Sta. Bul. 364* (*1933*), *pp. 179, figs. 69*).—Tables of monthly prices paid producers for varying periods, some beginning with 1852, are included for potatoes, apples, oats, barley, buckwheat, wheat, corn, hay, dry beans, milk cows, milk, butter, veal calves, beef cattle, chickens, eggs, horses, sheep, wool, lambs, and hogs. In general for each product, the tables and charts included and discussed show, by years, the acreage or number in the United States and in Maine, the relation of the index of Maine farm prices and the index of wholesale prices of all commodities in the United States, the monthly prices paid producers and the indexes of such prices (1910–14=100), and the annual farm prices and values per acre in the case of crops and the indexes of such prices and values and the indexes of purchasing power. Tables showing the retail price, cost of production, and the indexes of such prices and costs are included in some cases.

The agricultural situation in the United States and in Maine and the more outstanding problems in the adjustments of Maine agriculture are discussed.

Farm prices of cotton related to its grade and staple length in selected local markets in South Carolina, seasons 1930–31 and 1931–32, J. S. Burgess, Jr., and M. Guin (*South Carolina Sta. Bul. 290 (1933), pp. 31, figs. 5*).—This bulletin, made in cooperation with the U.S.D.A. Bureau of Agricultural Economics, reports the results of a continuation of the study previously noted (E.S.R., 66, p. 188). Data were collected from 8 local markets in 1930–31 and 3 markets in 1931–32, presented in tabular form, and (with other data) discussed.

It is concluded in part that "cotton prices paid to growers in South Carolina do not accurately reflect differences in the spinning value of the different grades and staple lengths. These prices varied so irregularly on the basis of grade and staple length during the seasons of 1930–31 and 1931–32, that it was not unusual for some farmers to receive considerably higher prices for some grades and staples than other farmers received for higher grades and longer staples sold in the same market on the same day.

"Average prices paid to growers were somewhat higher for the higher grades and longer staples, but the average premiums paid to growers for such grades and staples and the discounts made to growers for the lower grades and shorter staples were for the most part considerably less than those quoted in central markets. Average premiums and discounts received by growers were generally small compared with the variations in prices received for cotton of the same grade and staple length sold in the same local markets on the same day.

"Lack of knowledge of the correct classification and commercial value of cotton, differences in the character of cotton, inadequate volume of some grades and staple lengths, and differences in bargaining power of farmers are considered the principal factors responsible for growers not receiving a larger proportion of central market premiums and discounts for grade and staple length. Average prices paid to growers were somewhat higher in selected local markets where the cotton sold averaged relatively high in grade and in staple length.

"Needed adjustments in cotton production in South Carolina can be brought about (1) by perfecting the marketing system so that a greater proportion of the differences in spinning value of cotton of different grades and staple lengths will be reflected in the prices received by growers, and (2) by giving farmers accurate information regarding the varieties of cotton best adapted to each locality."

Flaxseed: Factors influencing price in North Dakota, H. E. Ratcliffe (*North Dakota Sta. Bul. 268 (1933), pp. 37, figs. 13*).—Analysis is made by the simplified method of graphic curvilinear correlation[3] for eight months, September to April each year 1922–23 to 1930–31. The factors used for each September, October, and November were: X_1, actual price of No. 1 flaxseed at Minneapolis expressed as a percentage of the price during the same month in the preceding year; X_2, index of the wholesale prices of all commodities (1926=100) expressed as percentage of the index for the same month in the preceding year; X_3, first of month supplies of flaxseed in Argentina in millions of bushels expressed as percentage of the supplies on the first of the same month of the preceding year; and X_4, estimated production of growing crop in Argentina in millions of bushels expressed as percentage of actual production for the previous year. Only the first three factors were used for the months December to April, inclusive.

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[3] A simplified method of graphic curvilinear correlation, L. H. Bean. Jour. Amer. Statis. Assoc., 24 (1929), No. 168, pp. 386–397.

Application of a simplified method of correlation to problems in acreage and yield variations, L. H. Bean. Jour. Amer. Statis. Assoc., 25 (1930), No. 172, pp. 428–439.

Tables and charts show (1) for each month the relation of the factors considered to prices and the relation of the actual and estimated prices, and (2) the relation of the estimated and actual prices during the entire period September 1922 to August 1931. An appendix includes tables of data used in the analysis, readings from the net regression curves, and other findings in the analysis. Another appendix describes the method of analysis and illustrates the steps.

The indexes of correlation for the several months were for September 0.942, October 0.975, November 0.913, December 0.899, January 0.912, February 0.942, March 0.935, and April 0.935, showing that the factors considered explained 88.9, 95, 83.4, 80.9, 83.2, 88.6, 87.4, and 87.4 percent, respectively, of the variance in price.

" Since the United States produces less flaxseed than is needed for domestic requirements, the domestic crop has little, if any, relation to prices of flaxseed in North Dakota except in years when the domestic crop is extremely small or is large enough to approach domestic requirements.

" When the demand for linseed oil as indicated by the index of the wholesale prices of all commodities is at a comparatively low level, the price level of flaxseed is also low. Prices will fluctuate about this level as the supply factors vary from time to time. Demand appears to be the most influential of the factors during the months of September, October, and November when the bulk of the domestic crop leaves farmers' hands, and then as the size of the new Argentine crop becomes established, the Argentine supply factor becomes more important."

Crops and Markets, [July–August 1933] (*U.S. Dept. Agr., Crops and Markets, 10 (1933), Nos. 7, pp. 233–280, figs. 3; 8, pp. 281–328, figs. 3*).—Included are tables, reports, charts, summaries, etc., of the usual types on crop and livestock estimates, market reports, the price situation, and the price movements of important agricultural products.

No. 7 includes an article on farm returns in 1932 based on the reports from 6,383 owner operators. A table shows for the United States and the geographic divisions the averages for size of farm, value of real estate and personalty, receipts from crops, livestock, and livestock products, and miscellaneous cash outlay for different purposes, net receipts, changes in inventory, interest paid, expenditures for improvements, value of food produced and used on the farm, value of family labor, and changes in the value of real estate. Comparisons are made with each year 1924–31 for the United States and with the year 1931 for the geographic divisions. Another table shows for all farmers for the years 1924–32 and for the geographic divisions for 1932 the proportion of farmers obtaining net returns within specific ranges.

No. 8 includes the midsummer outlook report for poultry and eggs and the summer dairy and sheep and wool reports.

RURAL SOCIOLOGY

Rural community trends: Second report, H. J. Burt (*Missouri Sta. Res. Bul. 199 (1933), pp. 48, figs. 11*).—This is a continuation of Bulletin 161

(E.S.R., 66, p. 684), and covers the results of the second and third years of the study. Index numbers for the entire three years and a full set of directions and forms whereby a rural community may apply the project to itself are presented. The broad objective of the project is to stimulate constructive and continuous community-wide action in planning and carrying out projects of community interest.

Relation of community areas to town government in the State of New York, C. R. Wasson and D. Sanderson (*New York Cornell Sta. Bul. 555 (1933), pp. 56, figs. 17*).—This study was made to determine the relations between the existing local areas of social and economic groupings of the rural people of the State and the towns, to what extent the town is furnishing those governmental services which may be best supplied by a local government, and whether, as at present constituted, the town is adapted to meet the needs of the rural communities of the future. Data derived from 5 sets of questionnaires were collected, analyzed, and discussed.

The towns of New York are very diverse, varying from sparsely settled rural towns to highly urbanized suburban towns with dense populations. The problems of each type of town, therefore, are so radically different from those of other types, that this study was limited to the farming and marginal farming towns. Historically the functions of the town have been the building of highways, administration of justice and of poor relief, protection of public health, supervision of elections, assessment of property, and collection of taxes. Gradually these functions seem to be passing over to the larger political units. Already police work has largely gone over to the State, and the construction of highways is rapidly going over to the counties. It seems that poor relief and public welfare will also pass over eventually. When roads and poor relief are gone, little will be left of the town as now constituted except an item of expense on the bill presented to the taxpayer.

To the average voter, the sole function of the town is to serve as his own unit of local self-government. This function, however, is a matter of furnishing such local service as the residents of the local unit may desire. Local government, therefore, as in the New England town, should correspond to the natural social and economic unit of the true localities. Changes in the nature of transportation, communication, and service have caused the majority of towns of New York State, because of the rigidity and inertia of town lines, to correspond no longer to community areas.

Changes in town government are suggested. A prominent proposal has been the incorporation of a new unit, the rural municipality.

Probably the most obvious conclusion to be drawn from this study is that all phases of town government and rural government, as they apply to the situation in New York, need much more detailed research. At the same time, the facts show that a majority of the towns are out of line geographically with the natural social and economic groupings, and the smaller towns are too small to support needed services and efficient local government. The ultimate objective is to regain that which was good in the original New England town, but which has been lost in the New York towns in the ensuing three centuries through the arbitrary nature of town lines—true local, or community, government.

Negro organizations and leadership in relation to rural life in Virginia, J. M. Ellison (*Virginia Sta. Bul. 290 (1933), pp. 88, figs. 3*).—This is the sixth in the series of rural-organization studies in Virginia (E.S.R., 68, p. 120). The evolution of rural Negro organizations is traced. Organization for moral uprightness first received emphasis, next fraternal features, and, much later, more definite and broader economic and educational emphasis. The organizations studied were the Beneficial Society of Free Men of Color; The Moral Association; numerous secret organizations, including the order of Good Samaritans, Knights of Jerusalem, the Odd Fellows, and others; semifraternal and insurance organizations, such as the Independent Order of St. Luke and the Grand United Order of Moses; educational organizations, including the Virginia State Teachers' Association and the Negro Organization Society of Virginia; and agricultural organizations and educational activities, such as agricultural extension and vocational agricultural work.

Six case studies of organization are also presented. It was found that Negro leadership in rural Virginia was for a long time confined almost entirely to ministers, who inspired the building of schools, the establishment of social-welfare institutions, and worked tirelessly for progress in community life. Minister leadership, however, was handicapped by poor training, meager financial support, and transiency. Fraternal organizations also discovered and trained a large number of local leaders. With the introduction of urban influence into rural life a new type of rural leadership has emerged, including physicians, extension specialists, and vocational teachers. Present-day types of leadership are illustrated by leadership case stories.

Rural Negro organizations were evaluated from the viewpoints of their positive and their negative results. On the negative side they sometimes gave rise to cliques and feuds in the community, tended toward social stratification, to become means of dishonesty and exploitation when the shrewd took advantage of the weaker element of the community, to become traditional and ceremonial and so far retard community progress, and sometimes wasteful and ineffective because of the absence of business methods and emphasis of nonessentials. Striking a balance, however, between positive and negative influences the view is expressed that the positive outweigh the negative. They promote cooperative effort, provide diversion, set up ideals, establish loyalties, and promote good health, morality, and security through insurance. They develop community leadership, foster education, and tend toward worthy solidarity.

It is recommended that interfraternal councils be formed for purposes of zoning, assignment of duties and responsibilities to lodges to meet the needs of their respective communities, and community planning; that purely traditional or sentimental organizations affiliate with more successfully functioning organizations; and that agricultural organizations seek to increase their effectiveness by offering fuller service to rural people, by helping farmers develop cultural appreciation of dramas, plays, and pageants, by introducing community centers featuring children's games, athletics, and community concerts, by helping the Negro farmer to utilize the telephone, electric power, and farm loans as means of socialization and economic security, and to appreciate and use his opportunity to share in making effective legislation for the common good of the community.

Other recommendations cover functions of the State Teachers' Association, State College for Negroes, and School Improvement League.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Adult education and rural life (*Amer. Country Life Conf. Proc., 15* (*1932*), *pp. VI+153*).—This volume includes the following papers and addresses delivered at the fifteenth American Country Life Conference, held at Wheeling, W.Va., October 14–16, 1932: Statesmanship in Rural Adult Education—Presidential Address, 1932, by A. R. Mann (pp. 3–22); Rural Social Trends—Their Meaning for Adult Education, by E. de S. Brunner (pp. 23–32); The Crisis in American Education, by J. Rosier (pp. 33–40); A Philosophy of Continuing

Education for the Church, by K. L. Butterfield (pp. 41–48); Twenty Years of Cooperative Extension Work, by C. B. Smith (pp. 49–57); The Extension Service of Tomorrow, by V. Elsinger (pp. 58–65); Economic Education Needed Today, by M. M. Coady (pp. 66–69); The West Virginia Life Study Institute, by A. H. Rapking (pp. 70, 71); Training Rural Recreation Leaders, by E. Gardner (pp. 72–75); The County Library, by A. J. Pratt (pp. 76–81); Extension of the Cultural Arts, by L. Hanmer (pp. 82, 83); Participation in Cultural Arts, by A. F. Wileden and A. A. Gessner (pp. 84–88); and An Extension Program, by M. M. Coady (pp. 89–91).

Also are included summaries of the forums on the agricultural extension system, adult education by religious organizations, the cultural arts, rural adult education through the schools, the extension of library service, and regional planning and adult education, and the following articles, which are part of the proceedings of the Student Section Conference, held at Bethany, W.Va., October 14–16, 1932: The Student Conference at Bethany College, by E. L. Kirkpatrick (pp. 125–130); What Are the Basic Elements? by E. Burnham (pp. 131–138); and The Needs of Farm Youth, by E. L. Kirkpatrick (pp. 139–145).

FOODS—HUMAN NUTRITION

The latent heat of foodstuffs, W. R. Woolrich, A. H. Cooper, P. W. Scates, A. L. Smith, and M. Tucker (*Tenn. Engin. Expt. Sta. Bul. 11 (1933), pp. 18, figs. 6*).—An apparatus and method for determining the latent heat of foodstuffs are described, and data obtained with various foodstuffs are reported.

When the latent heats are plotted against the percentage of moisture in the same samples, the results form a straight line curve, indicating a direct proportion between the latent heat and moisture content. Consequently the latent heat of any foodstuff (not containing alcohol) can be calculated in British thermal units per pound by multiplying the determined percentage of water within the foodstuff by 143.4, the latent heat of fusion of water. Tables are given of the latent heats of fusion of various fruits, vegetables, meats, fish, and dairy products as determined experimentally and computed, of the computed latent heat of other foods in the same groups, and of the freezing and melting points of various fruits and vegetables. A chart is also included from which either the latent heat of fusion or the percentage of water of fresh foodstuffs can be read when the other value is known.

A photomicrographic study of gelatinized wheat starch, S. Woodruff and L. R. Webber (*Jour. Agr. Res. [U.S.], 46 (1933), No. 12, pp. 1099–1108, pls. 2, fig. 1*).—This study from the Illinois Experiment Station was undertaken with the purpose of relating the factors of concentration, temperature of heating, and microscopic changes in the granules of hard- and soft-wheat starches to the ability of suspensions of the starch to assume form as a gel, inasmuch as a rigid paste of starch and water is responsible to an important degree for the physical properties of baked products made with wheat flours. It is noted that starch constitutes about 55 percent of the weight of the starch-water fraction of bread dough and from 35 to 40 percent of that of muffin and cake batters.

Starch was specially prepared from flours milled from two varieties of wheat (Fulhio, a soft red winter wheat, and Turkey, a hard winter wheat) made into suspensions of 5, 10, and 50 percent concentration and heated in a water bath, with frequent stirring, from room temperature to 96° C. Samples were removed at 5° intervals for examination of gel-forming powers and microscopic changes.

Very little difference was found between the hard- and soft-wheat starches. Photographs are given of the gels formed in different concentrations of starch heated in different ways and a few photomicrographs of hard-wheat starch, raw and heated in 5 percent suspensions to varying temperatures.

The critical temperature for gelation of a 5 percent suspension appeared to be 90°. Rapid heating at this temperature gave firmer gels than did slow heating, while temperatures of 95° or above gave the firmest gels. Suspensions containing 10 and 50 percent starch gelated rapidly at temperatures below those for the 5 percent concentration. The gel from the 10 percent concentration was shapely at 80° and from the 50 percent hard wheat at from 53° to 55° and soft wheat at 60°.

Photomicrographs of 5 percent suspensions showed that the starch grains remained unchanged through a temperature of 50°. At 55° there was evidence of slight swelling and the beginning of disappearance of birefringence which was completed at 60° for the hard and 65° for the soft starch. At these temperatures the granules began to assume the characteristic kidney shape. This became more exaggerated as the temperature rose, and at 93° the outer edges of the granules appeared to be perforated. In 50 percent concentration birefringence disappeared from the hard-wheat starch at 75° and from the soft wheat at 85°.

A list of 23 references to the literature is appended.

Nutritive value of high and low calcium-carrying wheat, E. C. and J. E. Greaves (*Jour. Nutrition, 6 (1933), No. 2, pp. 113–125, figs. 6; abs. in Utah Sta. Circ. 102 (1933), pp. 9, 10*).—Two varieties of wheat (Kota and Turkey) of widely varying mineral content grown on the Nephi Dry Farm Substation were tested for their nutritive value in feeding experiments on young rats. The two varieties had the following composition: Protein (Kota) 17.41 and (Turkey) 14.42 percent, calcium 0.08 and 0.055, magnesium 0.182 and 0.159, phosphorus 0.308 and 0.153, potassium 0.334 and 0.276, iron 0.006 and 0.006, and sulfur 0.253 and 0.202 percent, respectively. Six different groups of rats were fed for a period of 3 weeks a diet containing 9 parts of the Kota or Turkey wheat and 1 of a basal ration consisting of casein 24 g, yeast 32, sodium chloride 12, and dried cabbage 17 g. Groups 1 and 2 received no supplement and were kept in diffused light and in the dark, respectively. Group 3 received irradiated instead of untreated wheat and was kept in diffused light. Groups 4, 5, and 6, which were likewise kept in diffused light, received daily supplements of 2 drops of cod-liver oil, calcium carbonate in amounts to bring the calcium-phosphorus ratio of the diet to 2:1, and both cod-liver oil and calcium carbonate, respectively. From 10 to 38 animals were used for each variety of wheat in each test.

Growth was similar for both wheats in all groups except group 5, in which the animals receiving Turkey wheat made slightly better growth. Groups 1 and 2, receiving no supplement to the basal diet, grew less than all of the other groups, but in none of the groups was growth as satisfactory as on the Sherman stock diet. There was very little difference in the growth rate in groups 3 and 4, in which vitamin D was furnished by irradiation of the wheat and by cod-liver oil, respectively. Growth in groups 5 and 6 was superior to that in the other groups, showing the favorable effect of calcium carbonate.

The percentages of ash, calcium, and phosphorus in the extracted bones and of calcium and phosphorus in the blood serum were higher in all animals fed the high calcium Kota wheat than in those fed the low calcium Turkey wheat. The addition of cod-liver oil or calcium carbonate, either separately or together, increased the calcium content of the blood of the animals fed

Kota wheat, but with the Turkey wheat both were required to raise the calcium content of the blood to normal.

Commenting upon these findings, the authors emphasize the value of high calcium cereals in the diet. They raise the question as to what proportions of the calcium and phosphorus of the wheat occur in the flour, and whether or not it is feasible to breed high calcium-carrying wheats.

Effect of storage upon the bread-making qualities of Wyoming hard wheat flours, E. J. Thiessen (*Wyoming Sta. Bul. 198* (*1933*), *pp. 27, figs. 7*).—This is a complete report of a study noted previously from progress reports (E.S.R., 67, p. 85). Three flours were used—A, an 80 percent flour milled from a mixture of 30 percent Turkey Red winter wheat and 70 percent Marquis spring wheat from the 1928 and 1929 crops; B, a 95 percent flour milled from the same mixture of wheats of the 1929 crop; and C, a high patent flour milled from the 1929 crop of Marquis spring wheat. The wheats from which flours A and B were milled had been aged 8 and 12 months, respectively, before milling. Both flours were bleached and stored in well elevated dry concrete warehouses before shipping. Part of the wheat used for flour C had been aged 11 months and the remainder 4 months before milling and were stored in the laboratory. Quantities of each of the three flours were stored in the laboratory in tightly closed cans and in cotton sacks exposed to room atmosphere and were used after varying periods up to 48 months in absorption and baking tests by standard methods which are described in detail. Considerable difficulty was experienced in preventing drying and crusting of the surface of the dough during fermentation and the proofing periods on account of the dryness of the Wyoming atmosphere. This was finally overcome by introducing sufficient moisture into the proofing cabinet to raise the relative humidity to from 75 to 85 percent.

As judged by baking scores, the periods of storage beyond which deterioration was evident were from 1 to 24 months for A, 2 to 8 months for B, and 2 to 24 months for C stored in cans. For the samples stored in sacks the corresponding periods were 1 to 19, 1 to 8, and 1 to 18 months, respectively. The moisture content of the flour stored in cans showed little fluctuation, while that in the sacks increased or decreased depending upon the relative humidity of the atmosphere. The water absorbing power increased most rapidly and fluctuated most in flour stored in sacks. "When deterioration in flour occurred it was characterized by the moist, gummy texture of the loaf, small volume of loaf, and by the loss of the sweet, nutty aroma and flavor evident in bread made from newer flour."

As an additional test of the effect of variations in humidity on stored flour not protected from the atmosphere, a record was kept of the weights and moisture content of a 3-lb. sample of the flour stored in sacks in the laboratory and tested from time to time. The record confirmed the findings in the first part of the investigation that the moisture content varied directly with the relative humidity.

The authors conclude that "flour which is to be stored for considerable periods in warm, dry rooms, such as are common in the steam-heated houses of Wyoming, should be placed in containers which are airtight or practically so."

Chemical compositions of New Mexico pinto and bayo beans, M. L. Greenwood (*New Mexico Sta. Bul. 213* (*1933*), *pp. 11, fig. 1*).—Data are given on the composition of 24 samples of pinto beans obtained from four sections of New Mexico and representing crops from 1928 to 1932, inclusive, and of 5 samples of bayo beans obtained from crops from 1929 to 1932, inclusive. The beans were stored in galvanized bins or pails and kept free from moisture.

The Official methods were used for analysis except that the samples were not dried in vacuo for moisture.

Very little difference was found in the composition of the pinto beans coming from different regions which varied in altitude from 4,230 to 6,547 ft. and in location from the northern to the southern part of the State. Minimum and maximum individual values and the average for all 24 samples were as follows: Water 6.3, 9.2, and 7.9 percent; protein (N×6.25) 19, 26.9, and 23.9; fat 0.6, 1.4, and 1.1; ash 3.6, 4.6, and 3.9; and carbohydrate by difference 59.5, 67.8, and 63.2 percent, respectively. Figures for yield, number of irrigations, and proximate composition on a moisture-free basis are also tabulated. The general averages on this basis were protein 25.9, fat 1.2, ash 4.2, and carbohydrate 68.7 percent. The percentage of protein, which varied more than any other constituent, appeared to vary inversely with the crop yield.

Minimum, maximum, and average values for the 5 samples of bayo beans were moisture 5, 9.1, and 7.1; protein 20.1, 24.1, and 22.3; fat 1.1, 1.5, and 1.3; ash 3.3, 4, and 3.7; and carbohydrate 64.1, 67.3, and 65.6 percent, respectively. On the moisture-free basis the average values were 24, 1.4, 4, and 70.6 percent.

Frozen vegetables, R. P. STRAKA and L. H. JAMES (*Amer. Jour. Pub. Health, 23 (1933), No. 7, pp. 700–703*).—In this continuation of the investigation noted previously (E.S.R., 68, p. 560), the effect of freezing was studied on the survival and toxicity of *Clostridium botulinum* spores in hand-shelled peas which had been frozen in 16-oz. commercial glass jars. The same technic was followed throughout as described in an earlier paper. A total of 72 containers of frozen peas was tested, comprising 24 each of uninoculated, lightly inoculated, and heavily inoculated samples. The results obtained are summarized as follows:

"No toxin developed in peas which were examined immediately after defrosting, and none developed in those defrosted and held for 3 days in the ice box. Toxin was obtained from the spoiled peas in 1 of the 24 uninoculated containers, and botulinus cultures were recovered from 8.

"The spoiled contents of 3 of the 24 lightly inoculated containers were toxic, and cultures were obtained (presumptive identification) from 11. The 24 heavily inoculated containers showed 5 to be toxic after spoilage, and the organism was recovered (presumptive identification) from every container. All the toxic containers showed Type B toxin. Of the organisms recovered from uninoculated containers, 7 were Type A and 1 was Type B."

Bacterial content of frosted hamburg steak, L. P. GEER, W. T. MURRAY, and E. SMITH (*Amer. Jour. Pub. Health, 23 (1933), No. 7, pp. 673–676*).—Data are reported on the bacterial counts of 10 samples each of fresh, unfrozen hamburg steak bought in clean, first-class markets; Birdseye Frosted Hamburg steak bought from retail stores; and fresh hamburg steak purchased as in the first series, frozen by the Birdseye process, and tested immediately after freezing and one month later. The method of preparing samples is considered of the utmost importance, and the technic followed is described in detail.

The data show a definitely smaller number of bacteria in the frosted hamburg steak than in the fresh. In the first two series of samples, the average bacterial count of the unfrozen material was 18,100,000 per gram and of the frosted 2,000,000 per gram. In the third series the average percentage reduction of the bacterial counts immediately after frosting was 79.5 percent and the average reduction from the count of the freshly frozen sample to the count one month after storage at 0° F. was 24.5 percent. The total reduction from freezing and storing averaged 84.1 percent. "A sanitary standard considerably below 10,000,000 per gram seems warranted for this type of product, and bacteria counts of properly frosted and stored hamburg steak may be expected to be consistently lower than those of the best grade of the fresh product for sale in high-class meat markets."

Studies on the nutritive value of oysters, E. J. Coulson (*U.S. Dept. Com., Bur. Fisheries, Invest. Rpt., 1 (1933), No. 17, pp. II+30, figs. 8*).—This is the complete report of an investigation noted previously from a journal article (E.S.R., 68, p. 868).

Foods and drugs, J. M. Bartlett (*Maine Sta. Off. Insp. 147 (1933), pp. 20*).—In this annual tabulation of the results of examinations of food and drug samples collected by the State department of agriculture (E.S.R., 68, p. 408), the analyses of food materials include ice cream for fat content; maple sirups and maple sugar for water, sucrose, ash, and lead number; and oysters for free liquid, total solids, and salt.

A feeding tube for quantitative dietary experiments on rats, M. L. Tainter (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No 9, pp. 1234, 1235, fig. 1*).—The feeding tube described and illustrated is made from glass tubing 2 in. in diameter by bending to a right angle and sealing one end in such a way that the wrinkle produced when the tube is bent is accentuated into a small shelf projecting into the lumen at the bend. This serves to catch any food which the rats might scratch out and to cause it to drop back into the bulb. Tubing of this diameter may be used with rats weighing up to 250 g and with 75 g or more of the diet, depending upon the extent to which the bulb is blown out.

Milk for the family, R. S. Carpenter (*U.S. Dept. Agr., Farmers' Bul. 1705 (1933), pp. II+30, figs. 3*).—This supersedes Farmers' Bulletin 1359 (E.S.R., 50, p. 58), the subject matter of which has been entirely rewritten. In comparison with the earlier publication, the section on nutritive value has been considerably expanded from the corresponding section on food value, and the section on bacteria in milk has been expanded to include descriptions of various grades of milk. In a new section entitled "Choosing the Family Milk Supply" is incorporated the discussion of the choice of milk for infants, together with new material on soft-curd milks. The section entitled "Home Care of Milk" contains concise rules for consumers and directions for treating milk by 3-minute boiling, double-boiler heating, and home pasteurization. Of these three methods, the first is said to be favored in recent practice. The section on milk products has been enlarged, particularly the part devoted to dried milk, in which considerable attention is given to dried skim milk as a product "extremely valuable to welfare and relief organizations feeding large groups in times of emergency." Attention is also given to evaporated and dried milk in a section on milk in food preparation.

New tables on the average composition of milk of various kinds and of milk and milk products have been compiled by the food composition section of the Bureau of Home Economics.

The effect of dairy manufacturing processes upon the nutritive value of milk.—II, The apparent digestibility of fresh whole milk and of powdered whole milk, W. B. Nevens and D. D. Shaw (*Jour. Nutrition, 6 (1933), No. 2, pp. 139–150*).—In this continuation of the investigation noted previously (E.S.R., 68, p. 561), two commercial brands of powdered whole milk, one manufactured by the spray process and the other by the roller process, were compared with fresh milk for apparent digestibility, following the same technic as in the earlier study of evaporated milk.

No significant differences were found in the apparent digestibility of the two kinds of powdered milk. The digestibility of the fat and sugar were equal to that of fresh milk, but the digestibility of the protein of both types of powdered milk was significantly lower than that of fresh milk. The mean of 76 determinations of the coefficient of apparent digestibility of the protein of fresh whole milk was 91.8±0.14, while that of 26 samples of powdered whole milk was 87.4±0.22. The latter value was in close agreement with the previously reported mean of 88.4±0.25 for evaporated milk. The coefficient of apparent digestibility of the total solids lay between those of the protein and fat and were lower for dried milk than for whole milk.

"The authors believe that their work helps to clarify the situation which now exists with respect to the term digestibility as applied to milk. Claims that homogenization, evaporation, or drying, or a combination of these factors, makes the protein and fat of milk more completely digestible lack the support of adequate experimental evidence obtained in actual feeding tests. The authors' findings, however, do not preclude the possibility that manufacturing processes such as those just mentioned may affect the time required for the digestion of the protein and fat, or that they may make the milk more readily tolerated by some individuals. In view of the differences between individuals with respect to their tolerance for certain foods, it is entirely possible that in some cases the total nutritive effect of evaporated milk and of powdered milk may be more favorable than that of fresh whole milk."

Recent clinical experiences with 3,800 infants on evaporated, powdered, and condensed milks: A review, J. A. Tobey (*Arch. Ped., 50 (1933), No. 3, pp. 183–191*).—This is a brief review of the principal findings in 25 clinical studies covering a 4-year period from 1929 to 1932, inclusive, on the use of evaporated, powdered, and condensed milk in infant feeding. The reports of these investigations are thought to reveal no disadvantages in these processed milks. "Among the principal advantages of the concentrated milks are their exceptional digestibility, uniformity of composition, cleanliness and bacterial safety, high nutritive values, easy assimilability of calcium and phosphorus, convenience for making concentrated formulas, general availability, excellent keeping qualities, simplicity of use, and economy. The processed milks have been found entirely suitable for feeding prematures and the newborn, for corrective and therapeutic purposes, and for the satisfactory nutrition of normal, well infants."

A list of 31 references is appended.

Relation of milk ingestion to calcium metabolism in children, A. L. Daniels, M. K. Hutton, E. Knott, G. Everson, and O. Wright (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 8, pp. 1062, 1063*).—Calcium, phosphorus, and nitrogen retention studies are reported for a small group of children between 4 and 5 years of age who received in successive periods 1 pt. and 1 qt. of milk, respectively, as part of a diet containing adequate amounts of phosphorus, protein, fat, and vitamins from other sources. In one of the three series of comparisons the children received 10 cc of cod-liver oil daily, and in the second the same amount of cod-liver oil plus 8 drops of viosterol. In the third these supplements were not given, but the children spent a large part of the day out of doors (June and July).

In the first two series the average calcium retention was the same on the pint as on the quart of milk, and in the third the difference was only 0.001 g per kilogram in favor of the group receiving the larger amount of milk. The phosphorus retentions were all slightly higher during the periods in which the smaller amount of milk was given, and this was also true of the nitrogen in the first two groups.

The authors conclude that well-nourished children retain approximately the same amount of calcium whether receiving a pint or a quart of milk daily, but that greatly undernourished children may need somewhat more than a pint daily. "Seemingly the difference in the amount of calcium retained by children receiving different levels of milk above a pint reported by other investigators is not related primarily to the variations in the amount of sunshine to which the children were exposed, but to the difference in the physiological condition of the children studied."

Vegetable milk in infant feeding, J. Klein (*Arch. Ped., 50 (1933), No. 3, pp. 205–210*).—The author reviews briefly the literature on the composition, preparation, and value in infant feeding of coconut milk, almond milk, and soybean milk, and presents two case reports showing rapid improvement, with complete healing, of seborrheic eczema in infants on substituting commercial soybean milk for cow's milk.

Variations in serum calcium and phosphorus during pregnancy, J. W. Mull and A. H. Bill (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 7, pp. 854–856, figs. 2*).—In this preliminary report data are summarized from 3,501 determinations of serum calcium and phosphorus in a series of 579 dispensary patients throughout the course of their pregnancy in the interval between 28 weeks before delivery and 7 weeks post partum.

Two factors were found to influence the calcium concentration, (1) the progress of pregnancy, which brought about a gradual decline to a minimum at a few weeks before delivery, and (2) the season, with lower values for the same period of pregnancy during the first 4 months than the remaining 8 months of the year. There was no evidence of seasonal variations in phosphorus, and the only variation of significance was an immediate rise following delivery.

Repeated dental examinations of 358 women during 3 months or more of pregnancy revealed no connection between the condition of the teeth and the serum calcium or phosphorus.

Further studies on copper and iron, H. L. and H. H. Keil and V. E. Nelson (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 8, pp. 1153–1155*).—This continuation of the studies noted previously (E.S.R., 68, p. 134) deals chiefly with tests of the efficacy for growth and reproduction of rats of the various salts included in the mineral mixture of Daniels and Hutton (E.S.R., 53, p. 564) when fed as supplements to the milk-iron-copper diet.

Rats on milk supplemented with $FeCl_3$ and $CuSO_4$ grew at a considerably slower rate than rats on the stock ration. Growth was not improved by the addition of Na_2SiO_3, somewhat improved by $KAl(SO_4)_2$, and improved at first but with later evidence of toxicity by NaF. The addition of the entire Daniels-Hutton salt mixture with the exception of NaI brought about as satisfactory growth and performance as on the stock ration. The addition of $MnSO_4$ alone to the milk-iron-copper ration gave results even surpassing those on the stock ration. Reproduction after the first generation was better in the animals receiving the Daniels-Hutton salt mixture. Infection of the middle ear was very prevalent in the second generation rats on the milk-iron-copper ration, but occurred in only 2 out of 88 animals on this ration supplemented with manganese as $MnSO_4$.

The copper content of urine of normal individuals, I. M. Rabinowitch (*Jour. Biol. Chem., 100 (1933), No. 2, pp. 479–483*).—Following the technic of Ansbacher, Remington, and Culp (E.S.R., 66, p. 505) and of McFarlane as noted on page 12, the author, with the assistance of E. V. Bazin, determined the copper content of the urine of 50 normal individuals. The values obtained ranged between traces and 0.4 mg per liter or between traces and 0.7 mg per 24 hours. Similar variations were shown in the daily values over a period of 10 days for three subjects. In the two subjects fed copper (amount not stated), the copper values were 0.63 and 0.81 mg per liter or 0.84 and 1.01 mg per 24 hours.

Copper in the daily diet (*Jour. Amer. Med. Assoc., 101 (1933), No. 3, p. 212*).—In this editorial attention is called to the findings of Rabinowitch noted above, with the following comment:

" Obviously, people consume quite unwittingly, day by day, far larger quantities of copper than the data presented indicate. Probably there is more actual danger at present of excessive intake than of deficiency in the human dietary. At any rate the hasty inclusion of copper in present-day therapeutic programs may be ill advised. Intensive study of the problem for man is imperative."

The vitamin content of natural products, A. L. Bacharach (*Jour. Soc. Chem. Indus., Chem. and Indus., 52 (1933), No. 4, pp. 68–71*).—In this paper, read before a joint meeting of the Manchester section and the food group of the Society of Chemical Industry, Great Britain, the author questions the value of many of the vitamin content papers published during the past few years and presents a plea, not for more research as such, " but for a much closer coordination of this research, both within itself between the various workers already engaged in the technic of vitamin investigation, and more especially, in relation to the agronomist and plant physiologist and, to a less extent, the animal physiologist also. I think if such coordination could be brought about, and research based upon it carried out for the next 5 or 10 years, we might quite conceivably find ourselves in a position where the existing information would be replaced by something far more extensive and far more trustworthy."

Vitamin A content of foods and feeds, G. S. Fraps and R. Treichler (*Texas Sta. Bul. 477 (1933), pp. 34*).—This bulletin contains a general discussion on the nature, functions, and sources of the vitamins; a description of the modified Sherman-Munsell technic for determining vitamin A as developed in the authors' laboratory (E.S.R. 65, p. 294); a summary of hitherto unpublished data obtained in estimations of the vitamin A content of feeds and foods and a tabulation of these data, together with previously reported data from the authors' laboratory (E.S.R., 69, p. 418) and from other available sources, the values being expressed in Sherman rat units per gram, ounce, and pound; a discussion of the effect of various factors on the vitamin A content of animal and vegetable foods; and estimates of the relative cost of vitamin A in different foods.

The food materials for which new data are given, with their value in units per gram, include alfalfa leaf meal from 7 to 66.6, alfalfa stem meal 2.4, banana 2, Bermuda grass dried in vacuum 120, yellow carrot (raw) 67, dried 25, and dried in vacuum 77, sterilized carrot juice 0, corn varying from 0 and 0.5 in white to 8 in yellow, yellow corn meal 3 and 5, dried grapefruit peel and pulp less than 5, yellow hominy 8.3, dried whole milk 6.6 and 10, dried okra ends less than 2 and pods and seeds 3, dried orange peel and pulp from 3 to 6.6, peanut meal less than 0.5, pecan meats 1.6 and 2, pecan meats stored for 14 months less than 1, dried sweet green peppers 20 and 40, yellow sweetpotatoes dried in the air from 2 to 3 and dried in vacuum 50, canned spinach with juice drained off 100 and 140, spinach dried in vacuum and canned 333, dried turnip greens 33, and whole wheat less than 0.3 units per gram.

A list of 65 literature references is appended.

Effect of storage on vitamin A in dried foods, G. S. Fraps and R. Treichler (*Indus. and Engin. Chem., 25 (1933), No. 4, pp. 465, 466*).—The data reported in this contribution from the Texas Experiment Station were obtained by the Sherman-Munsell method with the technic described in Texas Station Bulletin 422 (E.S.R., 65, p. 294). The materials, all finely ground with the exception of some samples of corn, were stored at room temperature in mason jars and exposed to the diffuse light of the laboratory. The jars were kept tightly closed except while the portions were being removed for feeding. Of the unground corn just enough was removed and ground to feed the rats for from 2 to 3 weeks.

The materials tested, with their vitamin A content at the beginning of the experiment and after stated periods of storage, were as follows: Alfalfa leaf meal 10 units per gram, 8 after 8 months' and 5 after 11 months' storage: black-eyed peas 3 units per gram, 2 after 7 months', 1.5 after 9, and 0.7 after 14 months' storage; dried green pepper 50 units per gram and 10 units after 19 months' storage; powdered whole milk 10 units per gram and 3 after 9 months' storage; yellow corn 7 units per gram, 5 after 7 months' (ground), and 1 after 30 months' storage (ground); and Ferguson yellow dent corn 7 units per gram, 3 units after 5 months' storage unground and 2.5 after 6 months' storage ground. The other samples of Ferguson yellow dent corn gave approximately the same values.

Although it is recognized that the loss in vitamin A might be less for materials stored in a cooler climate or in cold storage, it is considered that the loss of vitamin A in dried samples stored in the laboratory should be taken into consideration in experimental work and that the loss in stored food may be a factor of considerable importance in connection with the feeding of animals or man.

Investigations on the conversion of carotene into vitamin A in the human body [trans. title], F. KAUFFMANN and W. v. DRIGALSKI (*Klin. Wchnschr., 12 (1933), No. 8, pp. 306–308, fig. 1*).—An extensive series of tests on the carotene and vitamin A content of various human organs and tissues is summarized briefly. The carotene determinations were made by a colorimetric method involving comparison with a standard solution of potassium dichromate and known amounts of carotene and the vitamin A by the antimony trichloride reaction.

In tests of the carotene content of the blood of 1,000 individuals, the highest value obtained was only 0.27 mg percent and in 85 percent of the samples traces only (about 0.01 mg percent) were found. When the content was higher than 0.01 mg percent, carotinemia was present as a result of excessive consumption of vegetables, particularly carrots. Repeated blood tests of individuals during a month in which 200 g of carrot juice or 2 eggs were consumed daily showed great differences in the rapidity and extent of carotene increase following a latent period of 1 or 2 weeks. In some cases the maximum value reached was 0.11 mg percent, while in others the amount increased to from 0.2 to 0.27 mg percent. Separate tests of the serum and corpuscles of the blood of subjects at the height of carotinemia showed the carotene to be present only in the serum.

The effect of infection upon vitamin A consumption was tested by determining the vitamin A content of the livers of individuals who had died of infections with that of others dying from other causes, but no significant differences were found. Negative results were obtained in vitamin A tests of the feces, urine, gall bladder, and perspiration. The brain was rich in vitamin A and in cases of carotinemia the ascites fluid contained appreciable amounts.

The authors conclude that the human organism retains its content of provitamin A and vitamin A very tenaciously and that the loss of its reserves depends solely on the demand for these substances. Only during the lactation period is there a considerable loss through the milk.

Injury from vitamin A [trans. title], W. v. DRIGALSKI (*Klin. Wchnschr., 12 (1933), No. 8, pp. 308, 309, figs. 2*).—A concentrate of vitamin A containing 40,000 rat units per cubic centimeter (a unit being defined as the smallest protective dose against vitamin A deficiency) was administered to 6 young rats by stomach tube in doses of 1 cc daily, and 6 controls were given the same concentrate irradiated to destroy vitamin A. Two rats were given 0.5 cc daily of the concentrate and 2 others the same dose of irradiated concentrate. As further controls, 4 rats were given 1 cc and 2 0.5 cc of peanut oil.

All of the rats receiving 1 cc of the untreated concentrate died in from 5 to 14 days, while of the controls receiving the irradiated concentrate only 1 died after 11 days. The 2 receiving the smaller dose of the concentrate died in 7 and 19 days, while those receiving the same amount of the irradiated concentrate, and all receiving peanut oil, survived. The animals succumbing to the overdosage showed roughened fur, emaciation, loss in weight after from 4 to 6 days, and after from 5 to 8 days catarrhal symptoms in the form of conjunctivitis and hemorrhagic rhinitis. The 2 on the smaller dose showed the same symptoms, although appearing later. The controls were all in good condition on autopsy.

The influence of avitaminosis A on the development of tuberculous infection in rats [trans. title], G. Szulc and S. Kolodziejska (*Compt. Rend. Soc. Biol. [Paris], 112 (1933), No. 6, pp. 591–593*).—Three series of experiments are reported in which rats deprived of vitamin A became sensitized to tuberculous infection when the organism was injected into the peritoneum in massive doses.

Modification of the tubercle virus in the rat under the influence of vitamin A in the diet [trans. title], G. Szulc and S. Kolodziejska (Compt. *Rend. Soc. Biol. [Paris], 112 (1933), No. 6, pp. 593, 594*).—Continuing the studies noted above, the authors inoculated rats on diets rich and deficient in vitamin A by intraperitoneal injection of 1 mg of a suspension of human or bovine tubercle bacilli. The animals on the A-deficient diet succumbed in from 6 to 10 weeks. Their organs (spleen and lymphatic ganglia) and those of the animals receiving the vitamin A-rich diet, killed at about the age of 6 weeks, were ground and injected into guinea pigs. The animals receiving the material from the rats on the vitamin A-rich diet remained in good condition, while the others developed tuberculous lesions.

Effects of variations in the amounts of vitamin B and protein in the ration, A. G. Hogan and R. W. Pilcher (*Missouri Sta. Res. Bul. 195 (1933), pp. 46, figs. 11*).—In this reinvestigation of the disputed question concerning the relationship between the requirement of vitamin B and protein, comparisons were made of the growth rate of rats on rations varying in their content of vitamin B (complex) and protein as follows:

One group received a ration deficient in both vitamin B and protein, a second the same ration with an additional allowance of vitamin B, a third a similar ration except for a much higher percentage of protein, and a fourth the high protein ration with the vitamin B supplement. Purified casein was used as the protein in amounts varying from 3 to 35 percent of the ration, and dried yeast (Harris laboratory) from 0 to 12 percent as the source of vitamin B. Two methods of feeding were used, ad libitum and regulated, the latter being identical with the paired feeding method except that 4 animals were used instead of 2, with the daily allowance of food adjusted to the smallest amount consumed by any of the group the preceding day.

When the regulated feeding was used, the groups on high protein grew more rapidly than those on low protein and the addition of vitamin B had no significant effect on the growth rate. "This is interpreted as evidence that the amount of vitamin B supplied determines how much food can be consumed, but has no effect on the rate of growth that quantity of food will sustain. Furthermore, the effect of increasing the protein content of the diet is specific, and does not vary with the amount of vitamin B supplied."

With the ad libitum feeding the high protein groups grew more rapidly than the low protein whether the amount of vitamin B supplied was high or low. Increasing the vitamin B allowance caused an acceleration of the growth rate on both low and high protein. The fat intake was increased by increasing the amount of vitamin B but not by increasing the amount of protein. The authors conclude that "within the limits of the protein levels used, convincing evidence was not obtained that the amount of vitamin B necessary for a certain rate of growth varies with the quantity of protein in the diet. The corollary conclusion is, the amount of protein necessary for a certain rate of growth does not vary with the amount of vitamin B supplied. If the ration is deficient in both protein and vitamin B, it is made more adequate for growth by increasing the amount singly of either constituent."

Effect of vitamin deficiency on gastric secretion, D. R. WEBSTER and J. C. ARMOUR (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1297–1300*).—Using 3 dogs with esophagotomy, gastric fistula, and obstructed pylorus, the authors were able to observe the effect of the introduction into the duodenum of diets deficient in vitamin B (complex). "In all 3 animals the results obtained were the same. The experiment consisted of removing all vitamins from the dog's diet. The gastric function was tested by sham feeding (nervous phase), subcutaneous injections of histamine, and the introduction of alcohol into the intestine (chemical phase). The secretion following the introduction of the food into the intestine was also noted. First, diminution and then complete cessation of gastric secretion occurred, on which 10 g of powdered yeast were added to the diet. In a few days a complete restoration of the secretory function of the gastric mucosa had taken place."

The observations are thought to indicate that the vitamins contained in yeast are necessary for the normal secretory activity of the gastric mucosa independently of loss of appetite and inanition, which never occurred under the conditions of the experiment.

Respiratory quotient of cerebral cortex in B_1 avitaminosis, H. E. HIMWICH, J. F. FAZIKAS, N. RAKIETEN, and R. SANDERS (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 7, pp. 903, 904*).—Evidence confirming the conclusion of Peters and associates (E.S.R., 68, p. 867) that the ability of the brain to oxidize lactic acid is decreased in polyneuritic pigeons is reported in data on the respiratory quotient of the excised cerebral cortex of 3 polyneuritic pigeons and of the intact and excised cerebral cortex of 1 dog. In all cases the values were below 1 in comparison with the value of 1 for normal animals.

Vitamin C content of frozen orange juice, E. M. NELSON and H. H. MOTTERN (*Indus. and Engin. Chem., 25 (1933), No. 2, pp. 216–218, fig. 1*).—In this investigation at the U.S.D.A. Bureau of Chemistry and Soils, frozen orange juice was prepared from Florida Valencia oranges late in the season by three methods: (1) Extraction in air and freezing under head space of air, (2) extraction in atmosphere of nitrogen and freezing under head space of nitrogen, and (3) extraction in air and freezing under head space of oxygen. The juice was frozen with solid carbon dioxide within 30 minutes from the time extraction was begun, and after freezing was stored at 0° F. The various samples were tested for vitamin C by the usual guinea pig feeding tests soon after freezing and after 10 months' storage. The juice, which was allowed to liquefy before feeding, was fed in 1.5 cc daily doses, with positive controls on the fresh juice from the same lot of oranges stored at 40° and with the customary negative controls.

The juice proved to be a less potent source of vitamin C than the juice tested in a previous study by Nelson and Mottern (E.S.R., 68, p. 418), but there were no appreciable differences in potency between the fresh juice and the various samples frozen as described. These findings are thought to indicate that vitamin C in orange juice is quite resistant to oxidation at low temperatures, and that under the conditions of the experiment there is no appreciable advantage from the standpoint of vitamin C in excluding atmospheric oxygen during the freezing process.

To obtain further information concerning the oxidative changes taking place in frozen orange juice and to correlate the vitamin C content with the reducing properties of 2,6-dichlorophenolindophenol (E.S.R., 69, p. 618), 10-cc portions of the various samples which had been frozen and stored for about a year were titrated with the indicator after neutralization with sodium acetate. The average titration values for the juices frozen with head spaces of nitrogen, oxygen, and air were 7.1, 6.7, and 6.6 cc, respectively. With the exception of one sample, all of the juices given the same treatment did not vary from the average of the respective group by more than 0.1 cc. The reducing substance was prepared in concentrated form from orange juice and dilutions equivalent to 2 cc of orange juice were fed to guinea pigs on a scorbutic ration, while other groups received 2 cc of orange juice, 0.5 cc of a glucic acid solution equivalent in reducing properties to 7 cc of orange juice, and no supplement, respectively. The glucic acid group died of scurvy at an average of 23 days and the negative control group at 21 days, while the groups on the orange juice and the concentrate grew normally and were in excellent condition at the end of the experiment.

The authors conclude that "the reducing value as determined by 2,6-dichlorophenolindophenol is not necessarily an accurate measure of antiscorbutic potency. . . . There may be many substances present in plant material which have some similar reducing properties. While glucic acid and hexuronic acid have similar reducing properties, the former has none of the physiological properties that have recently been attributed to the latter. However, in attempting to eliminate undesirable effects on vitamin C in commercial processes used for the preservation of such products as orange juice, the colorimetric titration may be a very useful guide."

Vitamin C content of frozen orange and grapefruit juices, L. W. Conn and A. H. Johnson (*Indus. and Engin. Chem., 25 (1933), No. 2, pp. 218–221*).—The juices used in this study included "fresh juice prepared from Florida oranges of the Valencia variety, frozen juices from the seedling, Pineapple, and Valencia varieties, fresh and frozen Puerto Rican orange juices prepared from Valencia oranges, a frozen orange juice prepared from an unknown variety of Florida oranges, and fresh and frozen Florida grapefruit juice." Except for the frozen Puerto Rican juice, which was prepared in the laboratory, all of the juices were prepared on a commerical scale essentially as follows:

Washed and graded fruit previously cooled to a temperature of from 4° to 5° C. were peeled by a mechanical peeling machine and the juice expressed by a screw-type press, filtered through a sieve, drawn into a vertical direct-expansion ice cream freezer operated under reduced pressure, and frozen to a slushy consistency. The slushed juice was discharged into an evacuated hopper connected with a filling machine, filled into ½-pt. paraffined cardboard containers (nitrogen being used to relieve the vacuum), frozen quickly at —24°, and stored at temperatures of —12° to —15°.

The method used for vitamin C determinations was essentially that of Sherman. Fresh orange juice was fed at 1.5- and 3-cc levels. The frozen juices, thawed by placing in cold water for 1 or 2 hours, or by keeping at 12° for 24 hours, were fed first at 1.5-, 5-, and 10-cc levels and later at levels of 0.5, 1.5, and 5 cc. Fresh grapefruit juice was fed at 1-, 2-, and 3-cc levels and the frozen juice at 1-, 2-, 3-, and 4-cc levels. Tests were also made of the pulp and juice separated by centrifugation.

The minimum protective dose per 300 g guinea pig of the orange juice was 1.5 and of the grapefruit juice 2 cc for either fresh, frozen, or centrifuged juice. The pulp afforded no protection, even in amounts equivalent to 10 cc of the juice, thus showing that the vitamin C is present only in the juice. The juice from the seedling variety of oranges was less potent than the other varieties. "It was later learned that the frozen seedling juice was not especially representative of commercial runs, having been produced from overripe oranges."

Stability of vitamin C in frozen orange juice during prolonged storage, H. H. Buskirk, W. E. Bacon, D. Tourtellotte, and M. S. Fine (*Indus. and Engin. Chem.*, *25* (*1933*), *No. 7, pp. 808–810, figs. 2*).—In the present study the frozen storage of orange juices for vitamin C tests such as reported by Nelson and Mottern and Conn and Johnson noted above was extended to periods up to 20 months with no "consistent or important change in vitamin C content."

The juice was fed in quantities of from 1 to 4 cc. There was some variation with respect to the rate of growth and the degree of scurvy in guinea pigs receiving 1 cc of the juice, but daily supplements of 2 cc conferred complete protection. In one lot of juice tested after storage for 1 year 7 months, a moderate decrease in potency was observed in that 2 cc conferred complete protection in only 3 out of 5 animals.

Attention is called to the desirability in further research of determining the optimum pH for storing frozen orange juice, in that there was some indication of a higher vitamin C content after storage in the lot which had the lowest pH value.

Studies on the biochemical activators of milk.—I, The relation between the reducing properties of milk and its content of vitamin C; the evaluation of milk as a source of vitamin C by chemical methods [trans. title], F. Schlemmer, B. Bleyer, and H. Cahnmann (*Biochem. Ztschr.*, *254* (*1932*), *No. 1–3, pp. 187–207, figs. 5*).—Included in this report are the experimental data on titration values with 2,6-dichlorophenolindophenol of milk and various milk products, essentially as noted from another source (E.S.R., 69, p. 309), together with a comparison of this method with the guinea pig feeding method for determining vitamin C as applied to milk pasteurized in various ways. The agreements by the two methods were such as to lead the authors to conclude that the reducing factor in milk is identical with vitamin C.

Antirachitic activation of milk by direct irradiation with ultra-violet rays, G. C. Supplee (*Amer. Jour. Pub. Health*, *23* (*1933*), *No. 3, pp. 225–229*).—This paper consists chiefly of a brief review of the development by the author and his associates of a satisfactory commercial method of irradiating milk (E.S.R., 69, p. 154). With the following paper it completes the symposium of the 1932 meeting of the American Public Health Association on milk of special antirachitic value (E.S.R., 69, p. 154).

Production of antirachitic milk by the feeding of dairy cattle, J. G. Hardenbergh and L. T. Wilson (*Amer. Jour. Pub. Health*, *23* (*1933*), *No. 3, pp. 230–236*).—In this report, the authors summarize the laboratory (E.S.R., 66, p. 463) and clinical (E.S.R., 66, p. 493) investigations carried on under their general auspices on the antirachitic value of milk from cows fed irradiated ergosterol or irradiated yeast.

An appraisal of antirachitics in terms of rat and clinical units, A. F. Hess and J. M. Lewis (*Jour. Amer. Med. Assoc.*, *101* (*1933*), *No. 3, pp. 181–184*).—Further clinical tests controlled by biological tests of irradiated milk, yeast milk, cod-liver oil, and viosterol (E.S.R., 68, p. 870) are reported, with the confirmation of the earlier conclusion that the antirachitic milks, particularly irradiated milk, "require a surprisingly small number of rat units (from 35 to 40 daily) to confer protection or effect healing, and that viosterol requires the largest number. Irradiated milk seems to be the most desirable antirachitic for prevention on a communal scale. Only 20 to 24 oz. daily is needed to assure protection. This therapeutic agent has the advantage of being automatic and inexpensive and of providing calcium and phosphorus as well as the antirachitic factor.

"The marked distinction between clinical units and rat units implies that the present method of rating antirachitic agents is misleading. Their respective biologic potencies, as expressed in rat units, are not interchangeable. Each type must be appraised for itself. Its minimal number of therapeutic units must be ascertained clinically and then expressed in terms of rat units. The wide differences in activity between various antirachitics indicate that a clinical as well as a laboratory pharmacology must be taken into account."

A biologic assay of blood and feces of infants receiving various antirachitics, A. F. Hess, M. Weinstock, and J. Gross (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1357, 1358*).—In this preliminary report it is announced that tests of the antirachitic potency of the blood and feces of infants which had been given various antirachitic agents, such as irradiated milk, viosterol, and cod-liver oil, showed that the variations in antirachitic potency of these agents, as noted above, could not be accounted for by the relative amounts of the antirachitic factor in the blood. When protective doses were given to the infants, a definitely larger number of units of vitamin D was found in the blood of those who had received viosterol than the other agents. These results were confirmed by tests of the feces. In general the absorption of the vitamin was relatively the same from the different agents. When a large number of units was fed more was recovered from the feces. Direct irradiation of the infant resulted in a moderate amount of antirachitic potency in the blood and no excretion of vitamin D in the feces.

Vitamin G potency of purified liver preparations, E. Brand, R. West, and C. J. Stucky (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1382–1384, figs. 2*).—A purified preparation of the pernicious anemia factor from Lilly liver extract 343, which gave a maximal reticulocyte response when injected into a pernicious anemia patient in a dosage of from 200 to 250 mg, was found to be ineffective as a source of vitamin G for rats when administered in doses as high as 40 mg daily, although the crude extract from which it was made was effective in doses of 50 mg. Tests of various fractions obtained in the course of purification showed that the vitamin G potency was lost during the initial stages of the purification.

Blood regeneration in anemic rats on a vitamin G-deficient ration, C. J. Stucky and E. Brand (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1404, 1405*).—Further evidence is given confirming the reports of Halliday (E.S.R., 67, p. 92) and of Sure et al. (E.S.R., 66, p. 199) that there is no relationship between vitamin G deficiency and iron deficiency as suggested by Bliss (E.S.R., 64, p. 595).

The treatment of anaemias, J. Vaughan (*Lancet [London], 1933, II, No. 2, pp. 63–66*).—In this paper various anemias are classified etiologically and discussed briefly from the standpoint of diagnosis and treatment. In the opinion of the author "an adequate and well-balanced diet forms an essential part in the treatment of all anemias, i.e., a diet containing fresh red meat, green vegetables, fresh fruit, milk, and butter."

Relationship of acidogenic bacteria to diet in production of dental caries in the white rat, J. L. Etchells and E. D. Devereux (*Soc. Expt. Biol.

and Med. Proc., 30 (1933), No. 8, pp. 1042, 1043; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 47).—In this preliminary report of an investigation at the Michigan Experiment Station supplementing the earlier studies of Hoppert et al. (E.S.R., 68, p. 711), the results are summarized of a limited number of tests of the effect upon the dental tissues of rats of sterile and nonsterile rations in coarse and finely divided state and with and without certain acid-forming organisms isolated from the mouths of rats and human beings with dental caries and from a fowl with eroded beak.

The animals on the coarse sterile ration inoculated with each of the four organisms tested all developed caries, as did those on the nonsterile ration uninoculated. No dental lesions were observed in the animals on the sterile coarse ration and the nonsterile fine ration. These findings are thought to indicate that "in the production of dental caries in the white rat there exists a relationship between the mechanical factors of impaction and the relative numbers of significant bacteria present."

High carbohydrate diets in diabetes, J. Eason and D. M. Lyon (*Lancet [London], 1933, I, No. 14, pp. 743–745*).—This discussion is based upon clinical observations at the Royal Infirmary. Edinburgh, on the effect of diets of high, low, and medium carbohydrate-fat ratios on 29 diabetic patients receiving insulin.

"It has been found that if the fat of the diet is considerably reduced, an addition to the carbohydrate is possible without an increase in insulin requirement. This usually results in a lower caloric intake. Where the fat is reduced and the carbohydrate is greatly increased to give a diet of the same caloric value, an increase of insulin is required. Diets of intermediate ratio (F.A./G. 1.0–1.2) were often found to be more satisfactory. Fat appears to make demands on the supply of natural or administered insulin. The insulin requirement of the diabetic appears to be most closely related to the total grams of foodstuff (C+P+F) consumed. It appears that much greater variations in the composition of diabetic diets is possible than has been hitherto allowed."

Iodine content of human skim milk from goitrous and nongoitrous regions, R. G. Turner (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1401–1403, fig. 1*).—Through the courtesy of the Detroit Mother's Milk Bureau and The Directory for Mother's Milk, Boston, the author was able to determine the iodine, inorganic phosphorus, and calcium content of the skim milk of 9 women in Detroit, a goitrous region, and 10 in Boston, a nongoitrous region, during 10 or 12 months of lactation.

The data, which are given as averages for the two groups, showed slightly higher values for iodine in the Detroit milk than in the Boston milk. In calcium and phosphorus the Detroit milk ran higher than the Boston milk for the first 2 or 3 months of lactation and then dropped to lower values. All of the values tended to fall somewhat after the first few months of lactation.

The author is of the opinion that the slightly higher iodine values in the Detroit milk "represent a compensatory action on the part of the physiological mechanism of the mother from the goitrous region to supply a greater amount of iodine to the child than is naturally supplied in the milk of mothers from a nongoitrous region."

Pellagra: An experimental study of the skin lesions, T. D. Spies (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1227, 1228*).—In this preliminary report evidence is presented to show that the dermatitis in human pellagra often improves while the patient is restricted to cornstarch and lactose. Unpublished observations are also cited showing that pellagra may involve the central nervous system, the gastro-intestinal tract, and the skin in the same patient or may affect only one or two of these systems, and that dermatitis and stomatitis may heal while there is a steady progression of the central nervous system disease.

"In view of this work and of the known observations concerning the lack of uniformity of the disease in involving the various organ systems of the body, it even appears possible that the specific chemical substance related to the development of the dermatitis is not the same as that affecting the other manifestations of pellagra."

TEXTILES AND CLOTHING

Textiles and clothing: Selected list of references on the physical testing of fabrics, M. B. Hays (*U.S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 8 (1933), pp. [1]+26*).—This mimeographed bibliography contains annotated references to English, French, German, and a few Dutch books and journal articles on the physical testing of fabrics. The references, which cover the period from 1920 to 1932, inclusive, with a few earlier citations, are classified under the headings general, air permeability, color fastness, durability, luster, stiffness, tensile strength, thermal properties, thickness, ultraviolet transmission, water absorption, waterproofness, and yarn number.

A study of flax fiber in relation to quality, R. M. Snyder and B. B. Robinson (*Melliand Textile Mo., 5 (1933), No. 2, pp. 55–57, fig. 1; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 1, p. 43*).—A method developed in cooperation with the U.S. Department of Agriculture for studying flax fibers microscopically is presented which may be of value in determining the degree of retting. The relationship between flax quality and arrangement of fibers within their aggregates was not pronounced. A strength test appears to be the most accurate test involving a single factor available for flax quality.

A study of some white English broadcloth shirts, M. E. Griffith and D. M. Siegert (*Ohio Sta. Bimo. Bul. 164 (1933), pp. 130–132*).—A study of the relationship of price to quality was made of six qualities of white broadcloth shirts for men. The shirts, which were bought in department stores, ranged in price from $0.48 to $3 50 and were all guaranteed to be preshrunk. One set of shirts was tested as they came from the store and corresponding ones after laundering 10 times with one day wearing between launderings. The shirt of the lowest price was greatly inferior to the others in material and workmanship. In general, with increased cost there was an increase in quality, although the relationship between price and quality was not very marked in the three shirts costing $1.09, $1.35, and $1.95, respectively. The two shirts of highest price were made of broadcloth which was heavier and thicker and had a higher thread count and longer fibers than the fabrics used in the other shirts. The shirt of lowest price was made from fabric having the lowest thread count, the shortest fiber, and the lowest yarn count.

All of the shirts shrank as a result of the first and continued launderings, with no definite relationship between price and shrinkage. At the end of the tenth laundering the cheapest shirt showed a shrinkage of 9.37 percent in warp and 1.56 percent in filling and of the most expensive 5.21 percent in warp and 4.68 percent in filling. All of the shirts showed losses in bursting strength after wearing and laundering. The cheapest shirt showed the least resistance and the two of highest price the greatest resistance in the breaking and bursting strength tests.

HOME MANAGEMENT AND EQUIPMENT

Cash contribution to the family income made by Vermont farm homemakers, L. H. Johnson and M. Muse (*Vermont Sta. Bul. 355 (1933), pp. 42*).—A group of 53 homemakers taking part in the standards of living study noted previously (E.S.R., 68, p. 424) formed the nucleus of this study. The families selected were those headed by husband and wife whose accounts were kept for a year during the period from 1928 to 1930, inclusive, and for whom complete knowledge concerning the farm business was available. To this group were added a group of 75 farm homemakers, an equal number of whom lived on main, secondary, and back roads, respectively, and a group of 40 who were known to have developed outstandingly successful enterprises. All data for the new groups were obtained in 1931 by the schedule method, and additional visits were made to the homes in the first group.

The extent of the cash contributions made to the family income is discussed separately for each of the three groups, after which an analysis is reported of the ways in which the earning homemakers among the entire number made their money. Of the 53 homemakers in the first group, 28 made cash contributions ranging from $12 to $741 and averaging $188 for the year. In the second group 10 of the 25 homemakers living on main roads, 7 on secondary, and 8 on back roads reported earnings varying from $79 to $675, with an average of $290; from $52 to $351, with an average of $203; and from $12 to $238, with an average of $78, respectively. Among 40 women particularly successful in earning, the average net profits were $385, with a range of from $100 to more than $500 for 10 of the group.

No definite relationship was found between the number of women making cash contributions and the condition of the road, distance from villages or cities, cost of living per cost-consumption unit, number of individuals composing the families, and age or schooling of the homemaker. Some of these factors, however, influenced the extent of the earnings. The chief incentive appeared to be a real need for cash, as shown by the fact that the net farm incomes averaged $425 less and the net worth of the farms $2,281 less on the farms of the earning than the nonearning women. Sixty-four percent of the wives on mortgaged farms and 44 percent on nonmortgaged were earning. However, less than half of the homemakers living on farms returning less than $1,000 income made any cash contributions. Several of the women developed money-making enterprises with the specific object of sending their children to college.

Among the 93 women making cash contributions to the family income, 123 different money-making enterprises were followed, of which poultry raising was the most common, with 31 cases, and boarding and tourist business next with 23. The only poultry flocks considered were commercial ones managed exclusively by the homemaker. The net profits derived by deducting from gross receipts the cash expenses, the value of marketable farm products used, and a reasonable figure for interest on the investment and depreciation ranged from $11 to $1,061, with an average of $258. Only 11 of the entire number cleared more than $200. Thirteen of the entire number earning money from poultry were in the group selected because of their success in earning.

The net profits for 13 taking summer boarders or tourists ranged from $4 to $1,135, with an average of $396, and of 10 taking regular boarders from $28 to $232, with an average of $108. Of the 69 miscellaneous enterprises, the lowest net profits were for housework, 2 cases, with an average of $19, and the highest operating roadside stands and cabins, 4 cases, with an average net profit of $626. Five women who sold canned foods earned from $19 to $646, with an average of $212. With these and other home-prepared food products, the finding of an adequate market was one of the greatest problems. "Another was standardization of their products, which involves the determination of the quality demanded by customers, the perfecting of recipes and methods necessary to bring the commodities up to standard, and the continuous production of goods of uniform quality."

The sources of the food used by Maryland farmers, M. Coffin (*Maryland Sta. Bul. 346 (1933), pp. 495–515, fig. 1*).—This report is based upon information collected by the survey method from 60 women in each of four counties in Maryland and from 41 rural storekeepers, 24 managers of canneries, and 9 millers in the same localities. The changes in food practices were limited to the ones made during the 10-year period, 1919–29, following the World War.

Following a discussion of the agricultural conditions, length of growing season, available crops, and relation of farm to food supplies and size of farm families, the information on food habits is presented under typical food groups and this is followed by a discussion of the various factors thought to be responsible for changes in food habits.

The principal changes noted are increased patronage of commercial services such as bakeries, canneries, general stores, orchards, dairy companies, and packing houses. An increase was noted in the use of green vegetables and fresh fruits and of home-grown vegetables taken to the canneries for canning instead of being canned at home. There appeared to be a decreased use of cured and an increased use of home-canned meats, a change from homemade to creamery butter, and an increased use of canned milk.

The cause most frequently mentioned by the women themselves as responsible for changes in food habits was increased knowledge of foods and their nutritional value. The sources of such information were given in decreasing order as the press, radio, hygiene classes, and homemaking clubs.

Fitting the mechanical refrigerator into the home, E. B. Lewis and M. P. Brunig (*Nebraska Sta. Circ. 45 (1933), pp. 11, figs. 7*).—The purpose of this publication is to point out some of the conditions under which the refrigerator has been expected to operate successfully and some of the effects of these conditions upon the operation of the machine. The effects on operation were studied in homes and in the laboratory where duplications of proposed settings were reproduced.

It was found that the operating characteristics of the mechanical refrigerator are often disregarded when refrigerators are placed in alcoves. From 35 to 50 percent increased operating costs may be incurred by faulty enclosures. Where the compressor unit is on top of the cabinet the alcove ceiling should be 12 in. or more above the coils. Where the compressor unit is enclosed within the cabinet and receives ventilation either through the back or sides of the cabinet a 3-in. space must be provided at the back or sides in addition to the top space. Where curtains, grills, or other objects prevent sufficient circulation of air over the top, a special air shaft may be installed.

Artificial light and its application in the home (*New York and London: McGraw-Hill Book Co., 1932, pp. VIII+145 [pls. 2], figs. 43*).—This book, which was prepared by the Committee on Residence Lighting of the Illuminating Engineering Society, has for its purpose the presentation of a practical, concise, and reliable treatment of artificial lighting and its application in the home. It contains chapters on light and people, fundamentals of lighting, characteristics of incandescent lamps, light and color, fundamentals of electricity, wiring for the home, lighting equipment, and lighting the rooms of the home. A dictionary of illumination terms is included.

MISCELLANEOUS

Science serving agriculture, A. P. CHEW (*U.S. Dept. Agr., 1933, pp. III+42*).—This pamphlet, prepared for distribution at the Century of Progress Exposition, Chicago, Ill., 1933, sets forth some of the accomplishments through research and other activities of the Department with a view to illustrating the character and usefulness of the Department as a whole.

Register of agricultural research in progress in Australia, 1933 (*Melbourne: Council Sci. and Indus. Res., 1933 pp. [2]+X+239*).—This is a mimeographed publication, in which data for each of the various projects under way are briefly summarized.

Information regarding recent publications (*Kansas Sta. Circ. 171 (1933), pp. 3*).—This circular briefly describes Bulletins 257–264 and Circulars 166–170, all previously noted.

Annual summary of publications, July 1, 1932, to June 30, 1933, B. C. PITTMAN (*Utah Sta. Circ. 102 (1933), pp. 10*).—In addition to abstracts of Bulletins 235–242 and Circulars 100 and 101, this contains abstracts of scientific articles published outside the station series and for the most part noted elsewhere in this issue or previously.

Bibliography of tropical agriculture, 1932 (*Roma: Internatl. Inst. Agr., 1933 pp. VIII+88*).—This is an annotated bibliography in English and French of about 420 articles published in 1932.

NOTES

California University and Station.—Howard R. Tolley, director of the Giannini Foundation of Agricultural Economics, has been granted an extension of his leave of absence to June 30 to enable him to continue as chief economist in the Agricultural Adjustment Administration in the U.S. Department of Agriculture. Dr. M. R. Benedict, professor of agricultural economics and agricultural economist in the station and the Giannini Foundation, has been granted leave of absence to take part in a study of the statistical work of several departments of the Federal Government. Dr. Ellis A. Stokdyk, associate professor of agricultural economics and associate agricultural economist in the station and the Giannini Foundation, has been granted leave of absence until June 30 to become president of the newly established Bank for Cooperatives of the Federal Farm Credit Administration in Berkeley.

Dr. Christian M. Tompkins has been appointed assistant plant pathologist in the station.

West Virginia Station.—As a result of extensive studies, a simple laboratory method has been developed by the associate agronomist which makes possible a prediction of the effect of a fertilizer on the acidity of soils. This method consists in burning off all organic matter in the fertilizer sample and determining by titration the amount of acid-forming or base-forming elements remaining, the results showing how much acid or base the fertilizer will produce in the soil. As a result of this discovery, it will, therefore(be possible for manufacturers of fertilizers to state on the labels not only the plant food nutrients contained but also the effect the fertilizer will have on soil acidity. Since practically all farm land in the Eastern and Southeastern States is acid in reaction and most of the crop plants grown in this region are injured by excessively acid soil, the substitution of such corrective materials as finely pulverized limestone for inert fillers may promote their utilization at small cost.

Association of Official Agricultural Chemists.—The forty-ninth annual meeting of this association was held in Washington, D.C., from November 6 to 8, 1933, with a representative attendance.

The address of the president, J. W. Kellogg of the Pennsylvania Department of Agriculture, was entitled The Regulatory Chemist of the Present and Future. The purposes and value of regulatory work were set forth, and the distinctive qualifications of administrative and research officials were considered in some detail. Effective regulatory control, President Kellogg made clear, is founded on research, and the need of maintaining and strengthening such research was emphasized as vital in a forward-looking program. Among the problems for whose solution such research must be relied upon were mentioned the determination of freshness in orange juice and the vitamin sources and iodine content of milk. The value of control work as an aid to the maintenance of high standards in industry was pointed out.

Among the handicaps to a full realization of the association's objectives, special stress was laid on inadequate financial support, both for individual enforcement agencies and the association's work as a whole. As an aid to the latter, the provision of a permanent endowment was recommended. Subsequently the appointment of a committee to investigate endowment possibilities was authorized.

The remainder of the program followed the general lines of recent years. The third Wiley memorial address was given by Dr. A. R. L. Dohme of

Baltimore, Md., on The History and Value of Germicides. Other general addresses were presented by Dr. H. R. Kraybill, State chemist of Indiana, entitled Scientific Progress and Feed Control Work, and by P. A. Webber of Madison, Tenn., on Soybeans.

Much of the final day was given over to a symposium on new analytical methods, among them suggested methods for rotenone, arsenic, and lead and on the importance of enzyme analysis in agricultural chemistry. At the business session, officers were elected as follows: President, R. Harcourt, Ontario Agricultural College; vice president, Dr. F. C. Blanck, U.S.D.A. Bureau of Chemistry and Soils; secretary-treasurer, Dr. W. W. Skinner, U.S.D.A. Bureau of Chemistry and Soils; and additional members of the executive committee, President Kellogg and Dr. Kraybill. H. A. Lepper of the U.S.D.A. Food and Drug Administration replaced Dr. Blanck as a member of the editorial board of the journal of the association.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 5, the following section officers were elected at the Chicago meeting, November 13–15, 1933: Agriculture, W. H. Brokaw of Nebraska, chairman, J. G. Lipman of New Jersey, vice chairman, and E. C. Johnson of Washington, scretary; engineering, O. J. Ferguson of Nebraska, chairman, and H. B. Dirks of Michigan, secretary; and home economics, Genevieve Fisher of Iowa, chairman, and Wylle B. McNeal of Minnesota, secretary. In the section of agriculture, the subsection of experiment station work elected C. P. Blackwell of Oklahoma, chairman, and Andrew Boss of Minnesota, secretary; the subsection of extension work, W. A. Munson of Massachusetts, chairman, and K. L. Hatch of Wisconsin, secretary; and the subsection of resident teaching, H. W. Nisonger of Ohio, chairman, and I. L. Baldwin of Wisconsin, secretary.

A considerable number of changes in personnel were announced in the various standing committees. Appointments for 3-year terms included the following: In the committee on instruction in agriculture, home economics, and mechanic arts, Dan T. Gray of Arkansas, Jessie W. Harris of Tennessee, and O. J. Ferguson of Nebraska vice P. J. Kruse of New York, Wylle B. McNeal of Minnesota, and Anson Marston of Iowa; college organization and policy, C. C. McCracken of Connecticut and A. G. Crane of Wyoming vice G. W. Rightmire of Ohio and E. C. Elliott of Indiana; experiment station organization and policy, J. T. Jardine of Washington, D.C. (reappointment), and B. E. Gilbert of Rhode Island vice W. H. Evans, Washington, D.C.; extension organization and policy, R. K. Bliss of Iowa (reappointment) and O. B. Martin of Texas vice D. P. Trent of Oklahoma; military organization and policy, T. O. Walton of Texas and E. M. Lewis of New Hampshire vice A. G. Crane of Wyoming and E. M. Freeman of Minnesota; engineering experiment stations, A. A. Potter of Indiana vice R. L. Sackett of Pennsylvania; the radio problem, F. A. Anderson of Colorado and F. D. Fromme of West Virginia vice T. B. Symons of Maryland and F. G. Helyar of New Jersey; aeronautics, L. D. Crain of Colorado and R. H. Smith of Massachusetts (reappointments); Land-grant institutions for negroes, W. C. John of Washington, D.C. (reappointment); joint committee on projects and correlation of research, F. B. Mumford of Missouri (reappointment); and joint committee on publication of research, L. E. Call of Kansas vice S. B. Doten of Nevada.

Vacancies for 1-year terms in the committees on military organization and policy and engineering experiment stations were filled by the appointment, respectively, of Alfred Atkinson of Montana and Paul Cloke of Maine.

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EXPERIMENT STATION RECORD

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EDITORIAL

RESEARCH AT THE 1933 MEETING OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

In a general way the discussions of research at the recent Chicago meeting represented a continuation and extension of those which had formed the main topics at the 1932 meeting in Washington. During the intervening period many impediments to research which had been foreseen in the prevailing economic situation and its accompanying psychology had become realities in the form of reduced experiment station revenues, increased pressure for special services, and a not infrequent lack of understanding of the significance of agricultural research and its fundamental relationship to public welfare. These conditions have come to constitute a concrete challenge to the efficiency of the stations, and inevitably they were given large prominence in the program and in both formal and informal discussions.

The subsection of experiment station work opened its session with a paper by Director W. C. Coffey of Minnesota dealing with accomplishments of experiment stations. Director Coffey pointed out some of the difficulties encountered in attempting to evaluate these accomplishments, since "certain researches by the stations stand out immediately upon their completion as contributions to the public welfare, others accumulate significance slowly through the years, still others serve as stepping stones to researches which receive popular acclaim almost at once, and finally, there are achievements coming out of the stations which are the result of their total attitude, life, and work which are tremendously significant but subtle and elusive."

The further problem is presented of how to utilize under existing conditions estimates such as those of the land-grant college survey which have necessarily laid much emphasis on achievements in an earlier era when production problems were paramount. Here the difficulty is to avoid the criticism sometimes encountered that if the stations stimulate production they are more essential in times of scarcity than when there is an overabundance. Actually, of course, what is needed is a readjustment of some of their activities, and to this the stations have shown themselves responsive, but this power of adaptability is not always fully realized. As an aid to this end, Director Coffey advocated the establishment of a special committee of the association to report "on accomplishments, on the new conditions in which we find ourselves, on our future tasks, and on possible procedures to place before the public as a product of the entire land-grant organization." Such a report, in his opinion, "would represent in large degree unity of thought on a common problem and would give promise of unity in action or coordinated action as nothing else would. It would go far in disarming carping critics and in developing wholesome good will which institutions of our sort need in rendering beneficial and lasting public service."

Director Wilmon Newell, of Florida, continued the discussion of ways of educating the public to the value of agricultural research, pointing out that the stations have a distinct obligation to the taxpayers to make available full information as to how public funds for research are expended, the value of the results obtained, and other considerations which have a bearing upon the scale of continued expenditure. He indicated that in Florida it had been found especially helpful to interest leaders in civic, business, and professional fields, as well as farmers, as to the nature and value of agricultural research, and mentioned success in reaching these classes through addresses and the preparation of condensed summaries of station activities and accomplishments.

The desirability of keeping prominently before the public the value of agricultural research was still further stressed in the report of the committee on experiment station organization and policy, which through its chairman, Director L. E. Call, of Kansas, maintained that "the agricultural research agencies individually and jointly have a responsibility of acquainting the general public with the material, social, and economic relations to public welfare, agriculture, and the scientific work that they are doing, and that it should be a well-organized, established policy to do so." The committee held that research as carried on by these agencies is one of the most profitable investments of the Sate and Federal Governments, increasing public wealth and indirectly public revenue, usually on a long-time basis. Continuity in this research was deemed essential, and it was made clear that while a productive research agency may be destroyed quickly by inadequate support, it "can not be rebuilt without much time and greatly added cost." Trained personnel are indispensable in the development of national programs, and much time has been saved by the fact that research agencies were already existing. In the opinion of the committee, such aspects should be emphasized in acquainting the public with the importance and value of agricultural research, and it was suggested that while details for doing this may best be determined by the individual stations, increased utilization might well be made of station and extension editors to study the entire problem and submit recommendations of methods.

A second subject relating to organization and policy developed by this committee was that of possible readjustments in the station research program to meet the new situation in respect to emergency investigations and special service with reduced budgets. Recognizing that the extent and character of the emergency projects and the amount of funds still available to the individual stations must determine in large measure both the extent and character of adjustments in the research personnel and programs, the committee pointed out that individual directors must decide upon the extent to which "the personnel, the established relationships between and among units of the station organization, the substations, the long-time fundamental research, and the established standards of research may be changed without unwarranted weakening of service to agriculture as a whole in the immediate or near future, as well as in the present season."

As guiding principles in these adjustments the committee advocated the maintenance of well-qualified men in key positions to assure competent representation of both the natural and social sciences, the consolidation of research facilities, the centralization of research financing in the director's office, and a serious effort to develop cooperation and coordination of work. Of these, special stress was laid upon permanence of personnel, as follows: "While difficult to measure and not spectacular, the daily and yearly service of the trained personnel of the stations has been an outstanding contribution promoting the welfare of agriculture and of the general public. Most effective application of accumulated findings from research as well as most effective research attack on a problem of agriculture depends first upon correct diagnosis of the case to which the accumulated findings or the research are to be applied. As the problems to be met become more complex and the accumulated findings increase both as to the field covered and the volume of facts to be mastered, the need increases for maintenance of a basic station staff, including such qualified key position men as necessary to assure competent representation of both natural and social sciences. To this end some sacrifice in the extent of emergency work, in the total research program, or in fundamental projects may be warranted."

Consideration of adjustments of research programs to present conditions also formed the theme of an entire session of the section on home economics, in which Dr. Louise Stanley, Chief of the U.S.D.A. Bureau of Home Economics, discussed the changing research program of that bureau, Miss Sybil L. Smith of the Office of Experiment Stations the needs for readjustment in home economics research programs at land-grant institutions, and Prof. Donald Slesinger, chairman of the social science research committee of the University of Chicago, standards of evaluating research programs. Miss Smith, in particular, while expressing the view that home economics research has thus far suffered no greater reduction of funds than has agriculture, indicated that consideration should be given to adjustments to meet reduced budgets, adjustments to meet the present emergency relief situation, and adjustments to meet the changing social and economic order, and emphasized the opportunity and need for food consumption studies, quality grades and standards for food, textiles, and other commodities, and standards of performance of various types of equipment.

Speaking primarily with reference to home economics, Prof. Slesinger also argued for a mobilization of existing facilities for an attack on the really significant problems of the day. While "in an ideal world," he contended, "idle curiosity would be the only criterion applied in the appraising of a research program," "in a real world, which at present is a tragic one, with limited resources, with growth benign or malignant eating away at the center of all our established institutions, we must select our projects not on the basis of idle curiosity or available methods but because of their importance to human welfare."

The opportunity before the experiment stations to aid in the emergency by studies of the better utilization of land was set forth by Prof. George S. Wehrwein, of the University of Wisconsin. Where formerly the aim was to promote the use of as much land as possible, under existing conditions too much is being cultivated, and the problem of the surplus acres has become outstanding. Prof. Wehrwein maintained that the stations should become fact-finding agencies for their respective States in land classification and utilization, pointing out some of the economic and social ramifications encountered in the formulation of policies for submarginal areas and the need of full information regarding the many and complex factors concerned.

A distinct and definite trend toward greater emphasis on research in economics, farm management, sociology, and home economics was noted by Director C. P. Blackwell, of Oklahoma, from a comparison of station projects in 1919 and 1930. He maintained that the program of production research has on the whole been amply justified and that such research "should still be pressed forward with all the energy possible," but he indicated that probably other lines of research "would pay greater returns just now." "It is not a case of having done too much for the individual farmer but of having done too little for farmers as a group," and he suggested a list of problems in economics and sociology which he believed would promote not only an efficient and prosperous industry but a competent and satisfying social and economic life.

Under present conditions the status of cooperation and coordination of work has become of unusual importance. The report of the joint committee on projects and correlation of research summarized the existing situation, finding continued cooperation with the Federal Department of Agriculture by 46 of the State experiment stations in from 2 to 40 projects each. Curtailment of State and Federal research funds had resulted, however, in a discontinuance by the Federal bureaus of 69 cooperative programs, a continuance on reduced funds of 312 programs, and a continuance without reduction of funds of 74 programs, with an estimated net reduction in allocated funds of about $700,000. None the less the committee concluded that "State-Federal coordination and correlation of research effort has attained far-reaching proportions, continues to grow in national importance, and is increasingly successful both in preventing undesirable duplication of effort and in pointing the way to a balanced rural and national economy."

Even more specific evidence of the efforts being made to increase cooperation was afforded in a special conference by the research administrative officers of the Department and the station directors to which the final session of the experiment station section was devoted. This conference was opened by a brief discussion by Mr. J. T. Jardine, Chief of the Office of Experiment Stations, as to the extent of undesirable duplication of effort in research, and was followed by a report on coordinating State and Federal research programs by Dr. S. W. Fletcher, director of research in Pennsylvania, as chairman of the special committee on such relationships, a statement of the policy of the U.S. Department of Agriculture by Dr. A. F. Woods, Director of Scientific Work, and in conclusion a general and intimate discussion of practical problems.

Considered as a whole, perhaps the most significant research aspect of the Chicago meeting was the frank recognition of a changed situation and a willingness to accept a full share of desirable readjustments in emphasis and viewpoint. The meeting was also very helpful, however, in demonstrating the continuing need of fundamental research as a basic necessity in meeting adequately the new problems of the day. It indicated concretely and unmistakably how indispensable the agricultural experiment station system has become as a permanent fact-finding agency, equipped and ready for a unique and essential service to the Nation in this direction.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Introduction to agricultural biochemistry, R. A. Dutcher and D. E. Haley (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. X+484, figs. 98*).—In the preparation of the present volume—an outgrowth of nearly 20 years' lectures to agricultural students and intended to be taken up after preliminary training in inorganic and organic chemistry—emphasis has been placed, wherever possible, upon the importance of further research and upon the facts that "agricultural and biological science is in a state of flux, and that the solution of many problems awaits the future investigator."

The authors have "devoted considerable space to the chemistry of the proteins, lipids, carbohydrates, and other compounds of biological importance," in view of their experience that "most courses in elementary organic chemistry do not have time to stress the importance of these compounds." The work is designed to serve also "as a general reference book for all readers who are interested in the part that chemistry has played in the development of agricultural science and in the intelligent and economical production of plants and animals."

Part 1, general and introductory, takes up the development of agricultural chemistry, chemistry of living matter, the carbohydrates, the fats and related compounds (lipids), the proteins, the physical state of matter, and enzymes. Part 2, the plant, discusses seed germination; the soil; soil acidity; farm manure; fertilizers; the atmosphere; insecticides, fungicides, and related materials; absorption of mineral nutrients by plants; assimilation of mineral nutrients by plants; the plant carbohydrates; the plant lipids; the vegetable proteins and related compounds; and respiration. Part 3, the animal, presents the topics foods and feeding stuffs, digestion of foods, the body tissues, metabolic changes in tissues, energy metabolism, biological response to foods, protein quality, vitamin A, vitamin B complex (B and G), vitamin C, vitamin D and ultraviolet light, and vitamin E.

Association theory of solution and inadequacy of dissociation theory, J. N. Rakshit (*Calcutta: S. C. Auddy & Co., 1930, pp. II+297, figs. 3*).—The author attempts a new interpretation of representative experimental observations on the phenomena of solution. The topics considered are solubility and specific gravities, contractions, surface tensions, viscosities, osmotic pressures, thermal effects, optical properties, and electrical effects of solutions.

Some factors affecting the electrolytes of the starch granules, D. W. Edwards and J. C. Ripperton (*Jour. Agr. Res. [U.S.], 47 (1933), No. 3, pp. 179–191, fig. 1*).—The principal ash constituents of a series of commercial starches are reported in tabular form, following which the authors of this contribution from the Hawaii Experiment Station report also upon the viscosity and composition of starches extracted from edible-canna rootstocks and from potato tubers stored during various periods and of other starches, showing that in the case of the edible-canna starch the drop in the viscosity of its suspensions was correlated with the decreasing potassium content and with the increasing calcium content. "The same changes in electrolytes could not be established in the potato series. In view of the contradictory nature of these results, it was concluded that some method of evaluating the ions according to their activity might give more concordant results. For this purpose electrodialysis and salt-replacement methods were used. Elctrodialysis did not change the relationship for the canna series, but did assist in bringing the potato series into better agreement. Salt replacement appears to be more effective than cataphoresis in the removal of bases, but less reliable in the matter of obtaining duplicates. Significant amounts of cations are removable by shaking with distilled water.

"Study was made of the effect of the changes in the electrolytes in plant sap on the starch in vivo. The results showed that while the electrolytes held by the starch are affected to some extent by differences in plant sap and growth conditions, the effect is small compared with the correspoding effect on the starch in vitro. Electrolyte changes in starch due to storage of the rootstocks are larger than those produced during normal growth. It was concluded the electrolytes occurring in starch in vivo are largely determined by the protoplasm of the plant cell rather than by direct chemical equilibrium with the electrolytes of the plant sap."

The effect of heat on the colloidal, physical, and chemical changes occurring in milk, E. R. Garrison and H. Jenny (*Missouri Sta. Bul. 328 (1933), pp. 21, 22*).—Data are briefly summarized.

Proteins of the whey fraction in milk from normal and abnormal udders, F. S. Jones and R. B. Little (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 101–109, figs. 3*).—This study was undertaken to determine a method for estimating the proteins of whey and also to show by means of precipitation tests the relationship between certain whey proteins and those of the blood serum.

A volumetric method for determining the quantity of proteins other than casein was worked out and is described. The method is not satisfactory as a quantitative measure of the various fractions of whey proteins. The volume of the protein precipitate obtained by this method could be correlated with the actual quantity of protein as determined colorimetrically.

The results of the study indicated that normal milk contained a fairly uniform quantity of such proteins, but that abnormal udder conditions usually increased the amount. Observations suggested that the proteins in the milk produced during mastitis originated in the blood. Differences were found in the albumin-globulin ratio in normal milk and in milk from abnormal udders.

[The pyrethrin content of pyrethrum flowers], W. H. MacIntire (*Tennessee Sta. Rpt. 1932, pp. 24, 25*).—Analyses are reported.

Microbiological studies of salt in relation to the reddening of salted hides, L. S. Stuart, R. W. Frey, and L. H. James (*U.S. Dept. Agr., Tech. Bul. 383 (1933), pp. 24, pls. 4, figs. 3*).—Out of 35 samples of crude solar-evaporated salts and 39 of open-pan evaporated grainer salts, 34 and 25, respectively, were found contaminated with the hide-reddening chromogens. All the kiln-dried solar-evaporated salts (12 samples from 1 source), all the vacuum-pan evaporated salts (17 samples), and all the mined or rock salts (62 samples) were found to be free from contamination with these organisms.

As a culture medium for the determination of the presence of the reddening organisms a broth medium prepared from hide, rice, and salt in high concentrations was found satisfactory. Also, "by subculturing mixed red chromogenic growths obtained on media of high concentrations of salt in dextrose broth, and then employing a large number of dilutions and many duplicate platings of each in dextrose agar with no added salt, red chromogenic microorganisms have been isolated in apparently pure culture. These isolations have been made from crude solar salts from South America, Spain, Turks Islands, Utah, and California, and from four domestic artificially evaporated grainer salts. Under specified conditions these organisms are capable of producing flesh reddening on salted hides and skins."

The presence of the organisms appeared not to be correlated with the pH value shown by the commercial hide-curing salts in which they were found. The capacity of the organisms to tolerate high salt concentrations was markedly increased by repeated culture on media of high salt content.

The red chromogenic growths as developed on highly saline media appeared to include a decidedly heterogeneous microbial flora. The organisms principally concerned "have been identified preliminarily as belonging to the higher bacteria, either in the Thiobacteriales under the Rhodobacteriaceae, or in the Myxobacteriales."

The relative velocities of the photochemical reactions of carotene and vitamin A with radiation of wave-length 2,650 A, W. J. Dann (*Biochem. Jour., 27 (1933), No. 1, pp. 274–278*).—It is reported that the earlier observations of Bowden and Snow (E.S.R., 67, p. 500) concerning the transformation of carotene into vitamin A on irradiation could not be confirmed [note, however, a later report by Bowden et al. (E.S.R., 69, p. 772)]. Further evidence that the end point of the irradiation of carotene cannot be vitamin A is shown in observations that a vitamin A concentrate dissolved in cyclohexane was more rapidly destroyed than a similar solution of carotene when exposed to radiations of wave length 2,650 A.

The author is of the opinion that the general assumption of Bowden and Snow concerning the importance of photochemical methods in vitamin chemistry "must be regarded as unfounded until evidence is accumulated in support of them."

Determination of vitamin A in oils by a spectrophotometric method, A. Chevallier and P. Chabre (*Biochem. Jour., 27 (1933), No. 1, pp. 298–302, figs. 4*).—The principle of the technic employed is described as follows:

"A continuous ultraviolet radiation, emitted by a hydrogen tube, is dispersed by a quartz monochromator. At the end of the monochromator is placed a potassium photoelectric cell covered with a fluorescent substance. The photoelectric current, generated by the light of the fluorescence, is amplified and measured by a galvanometer. There is a constant ratio between the ultraviolet radiation, the intensity of the fluorescence, and the photoelectric current. Direct readings on the galvanometer give with consistent accuracy the value of the absorption of a substance placed in the radiation between 4,000 and 1,800 A."

This paper deals chiefly with a comparison of the results obtained with the method described and the biological method with several samples of cod-liver oil in varying dilutions. The data showed remarkable agreement when the free acid content of the oil was low and the oil was not too highly pigmented. In commenting upon the relative merits of the two methods, the authors state that "we think that the spectrophotometric method is interesting not only because it is more convenient and more rapid than the biological method, but also because it allows the direct assay of products which might contain a large quantity of vitamin. It is well known that the biological test is only valuable if the quantity of the sample administered to the rats corresponds roughly to the quantity of vitamin necessary for the maintenance of normal growth. It is therefore difficult to titrate products which contain large amounts of vitamin. One has then to make a great number of estimations with different dilutions on a great many groups of animals. This difficulty does not exist with the physical method."

Large scale preparations of vitamin B_1 and vitamin B_4 concentrates, H. W. KINNERSLEY, J. R. O'BRIEN, R. A. PETERS, and V. READER (*Biochem. Jour., 27 (1933), No. 1, pp. 225–231*).—This paper gives the complete details, with diagram, of a large scale process for preparing vitamin B_1 and B_4 concentrates from baker's yeast. In the method as described 100 kg of yeast is used at a time, but by running several processes at the same time 200 kg or more can be treated simultaneously. The method, which is based upon the original Kinnersley and Peters procedure (E.S.R., 58, p. 89) and has been described briefly (E.S.R., 68, p. 725), leads to a vitamin B_1 concentrate still contaminated with vitamin B_4. Suggestions are given for the complete removal of this factor or, if its presence is desired as in vitamin B_2 tests, for a shortened process.

Crystalline preparations of vitamin B_1 from baker's yeast, H. W. KINNERSLEY, J. R. O'BRIEN, and R. A. PETERS (*Biochem. Jour., 27 (1933), No. 1, pp. 232–239*).—This paper describes in detail the technic followed in the preparation of highly active crystalline concentrates of vitamin B_1, as noted from a preliminary report (E.S.R., 68, p. 725). Even higher activities are reported than in the earlier note. The average activity in terms of day doses for pigeons by mouth is said to vary in the most recent experiments from 1.6 to 2.8 γ. One day dose has been calculated to correspond to about 1 international vitamin B_1 unit. Evidence is submitted that the crystals are not only more potent than those described by Ohdake (E.S.R., 69, p. 6), Van Veen (E.S.R., 69, p. 324), and Windaus et al. (E.S.R., 67, p. 101), but vary slightly from them in percentage composition. The values for carbon and sulfur are distinctly higher.

Three possible explanations for these discrepancies are suggested: (1) That all crystals hitherto made are a mixture of active and inactive vitamin B_1, (2) that the crystals contain vitamin B_1 as impurity, and (3) that more than one compound can function as vitamin B_1.

The chemical nature of vitamin C, J. L. SVIRBELY and A. SZENT-GYÖRGYI (*Biochem. Jour., 27 (1933), No. 1, pp. 279–285, fig. 1*).—Further evidence of the identity of vitamin C with the hexuronic acid now known as ascorbic acid (E.S.R., 69, p. 11) is given in chemical studies on the crystalline preparations obtained from the juice of the Hungarian variety of paprika (Hungarian red pepper, *Capsicum annuum*.) In preliminary feeding experiments guinea pigs were kept practically free from scurvy during a 53-day period on daily doses of 0.25 to 0.5 cc of the juice, the same lot of which, stored in vacuo at 0° C., was used throughout the experiment.

The authors have prepared from paprika juice, by a method which is described in detail, well-formed crystals of ascorbic acid with a yield before purification of from 5 to 6 g per 10 l of juice. Protection against scurvy in guinea pigs during a 65-day period was secured with 0.5 mg of the unpurified crystals. The chemical examination of the ascorbic acid has been noted from a preliminary report by Vargha (E.S.R., 69, p. 773). Further studies noted include proof of the undiminished antiscorbutic activity of crystals of ascorbic acid from ox adrenal glands after five recrystallizations and estimations of the ascorbic acid content of the adrenal glands of guinea pigs on very liberal and restricted diets of spinach, on the basal diet for 9 days and for 20 days, and on diets supplemented with 1.5 cc of lemon juice, 0.5 mg of ascorbic acid from paprika, and 1 mg of ascorbic acid from the acetone derivative, respectively.

The data show not only that the ascorbic acid content of the adrenal glands varies with the vitamin C potency of the diet, but also that animals on restricted amounts of vitamin C may show no symptoms of scurvy and yet be greatly depleted of their store of this vitamin.

Rapid colorimetric determination of potassium in plant tissues, V. H. Morris and R. W. Gerdel (*Plant Physiol., 8 (1933), No. 2, pp. 315–319*).—In a contribution from the Ohio Experiment Station, working in cooperation with the U.S.D.A. Bureau of Plant Industry, the authors report a successful application of the method of Jacobs and Hoffman (E.S.R., 67, p. 205) in the analysis both of the expressed sap of fresh plant tissue and of the dissolved ash of dry material. In the form of the method here described, the green color produced upon adding to the redissolved precipitate of potassium cobaltinitrite suitable solutions of potassium ferrocyanide and of choline hydrochloride was compared in a Klett colorimeter with a standard color solution produced by treating a solution containing 2 mg of potassium per milliliter in a manner exactly corresponding to the treatment of the sample. "This method of standardization is necessary, since it has been shown by previous workers that the composition of the precipitate with respect to the sodium content is influenced somewhat by the relative quantities of potassium and precipitating reagents."

It was found that "the method compares very favorably with the chloroplatinate method with respect to precision; and the saving of time and labor, permitting the handling of a larger number of replicates, results in a much greater final precision."

Determination of iron in biological material, R. F. Hanzal (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 7, pp. 846–848*).—The author proposes the determination of the iron content of small samples of biological material (e.g., 0.2 cc of blood) by means of a colorimetric comparison of the purple compound formed on adding thioglycolic acid to the dilute ferric solution and bringing the pH value of the solution from 8 to 10 by treatment with ammonium hydroxide with the color similarly developed from 1 cc of a 0.01 percent standard iron solution.

Method for blood.—Measure 0.2 cc of blood accurately into a Pyrex test tube, 20 by 180 mm, calibrated at 10, 15, and 20 cc. Add 1 cc of 10 N sulfuric acid and introduce a small piece of silica or a glass bead to prevent bumping. Heat, preferably over a hot plate, to evaporate the water. As soon as the material chars, cool for 45 seconds and add 4 drops of 30 percent hydrogen peroxide drop by drop. Continue the heating for 5 minutes after the solution becomes colorless. Allow it to cool and add 10 cc water. Into a similarly calibrated Pyrex test tube accurately measure 1 cc of standard iron solution containing 0.1 mg iron and dilute with distilled water to about the 15 cc mark. Add one drop (0.05 cc) of thioglycolic acid to both standard and unknown, mix by lateral shaking. Run in concentrated ammonium hydroxide from a burette until the permanent purple color makes its appearance, pH of 8 to 10. Mix contents of each tube, make up to volume of 20 cc with distilled water, and mix again by inversion. "Comparison is then made in the colorimeter. The simplified calculation is 1000/R=mg iron per 100 cc blood."

Method for urine, feces, milk, etc.—A portion of material to be analyzed is evaporated to dryness, ashed in an electric muffle furnace, and the ash dissolved in 6 N hydrochloric acid. The insoluble residue is filtered off, washed, and filtrate made up to volume of 50 or 100 cc. To separate the iron from all possible interfering substances, use cupferron. Measure an aliquot, 25 cc, of the acid solution of ashed material into the Pyrex test tubes used in the case of blood, add a dilute solution of $KMnO_4$ drop by drop until a permanent pink color appears (to oxidize all the iron to the ferric state). Add 5 drops freshly prepared 9 percent solution of cupferron. Mix well and centrifuge at a rather high speed for 4 minutes. Decant the supernatant liquid. In case the iron concentration is very low, add another aliquot portion of the acid solution of ashed material, oxidize with $KMnO_4$ as before, add more cupferron, mix, and centrifuge.

"The final precipitate is digested by adding 1 cc of 10 N sulfuric acid and heating over a microburner. When the material is well charred, add 30 percent hydrogen peroxide drop by drop and continue heating until a clear solution is obtained. Allow tube and contents to cool, add 10 cc of water, one drop of thioglycolic acid, make alkaline with concentrated ammonium hydroxide, make up to volume of 15, 20, or 25 cc. The standard may consist of 0.05 or 0.10 mg iron, depending upon the quantity of iron in the unknown. The color is developed here as in the case of blood and comparison made in the colorimeter."

The recovery of iron added to biological material was found to be quantitative, and the presence of phosphates did not interfere even in such proportions as those of 750 mg of orthophosphate or 500 mg of pyrophosphate per 0.1 mg of iron. Color proportionality was shown to be practically perfect over the range 0.04 to 0.50 mg.

Methods of analyzing dairy products, A. C. Fay et al. (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 277–288*).—A report is submitted by the subcommittee on bacteriological methods of examining ice cream of the American Dairy Science Association in which the various methods of analyzing ice cream are presented in condensed form. The views expressed are those of the committee and are printed for criticisms and suggestions.

The chemical analysis of butter, E. S. Guthrie et al. (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 300–306, figs. 3*).—A subcommittee on chemical analysis of butter of the American Dairy Science Association submits this report on a method adapted to the complete analysis of butter in the laboratory.

The microbiological analysis of butter, E. H. Parfitt et al. (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 289–299, fig. 1*).—A report is presented by the subcommittee on microbiological methods of examining butter of the American Dairy Science Association, giving in a condensed form the accepted methods for the bacteriological analysis of butter.

An improved method for preparing the serum of butter for pH determinations, K. G. Weckel (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 249–251*).—In this article from the Wisconsin Experiment Station the author discusses a new method for the preparation of butter serum for pH determinations. The method markedly decreases the amount of butter required and also reduces the time and temperature factors.

Canning of chilled and frozen fruits, F. Hirst and W. B. Adam (*Univ. Bristol, Fruit and Veg. Preserv. Res. Sta., Campden, Ann. Rpt., 1932, pp. 69–74*).—Samples of various fruits were chilled to 34° F. and kept at this temperature for periods up to one week before canning. No marked deterioration in color, flavor, or texture took place, except in Victoria plums, which developed a slightly bitter flavor after four days. The possibility of mold development is noted. Freezing at 10° for several weeks led in most cases to an inferior canned product, but the changes could largely be checked by freezing in sugar or sirup. Ripening and enzyme changes appeared to take place slowly at 10°.—(*Courtesy Biol. Abs.*)

Factors concerned with the fermentation of honey, A. G. Lochhead (*Zentbl. Bakt. [etc.], 2. Abt., 88 (1933), No. 13–16, pp. 296–302, figs. 3*).—Examination of 128 samples of normal honey showed the presence of sugar-tolerant yeast in all cases, confirming a previous study of 191 samples. Yeast counts were 1 to 1,000,000 per gram. The tendency of honey to ferment within 1 year increased with increased yeast infection. The view that the amount of yeast infection, apart from moisture, is a factor directly affecting fermentation was confirmed. Although the honeys varied in their content of so-called "bioactivator", capable of stimulating the activity of osmophilic yeasts, yet this factor is not considered significant in affecting the spoilage of honey under practical conditions. Fermentation is conditioned essentially by the moisture and yeast infection of honey, and a zone of probable safety with respect to these factors is indicated.

The effect of ultra violet rays upon the fermentation efficiency of yeast in the alcoholic fermentation of molasses, W. L. OWEN and R. L. MOBLEY (*Zentbl. Bakt.* [*etc.*], *2. Abt.*, *88* (*1933*), *No. 13–16*, *pp. 273–286*, *figs. 3*).—Exposure of yeasts to ultraviolet rays increased their fermentation efficiency on cane molasses wort and was likewise reflected in a more rapid rate of development of the cells. Exposure of 1 minute to light of 2,300–3,100 a.u. gave the greatest stimulation of cell development, while exposure of 3 minutes was reflected in a retarded rate of development and a correspondingly slower rate of fermentation. Exposure of yeasts to ultraviolet light induced an increase in their fermentation efficiency on molasses wort that had been thoroughly sterilized, showing that all the benefits of irradiation cannot be attributed to elimination of inimical micro-organims, which might otherwise compete with the yeast in utilization of the sugars. Irradiation of wort resulting in benefits comparable to the same treatment is also an important factor in explaining the benefits that it contributes. Exposure of yeast colonies to ultraviolet light also increased their fermentation efficiency, but not to the extent of exposure of the cells in a liquid substrate.

It appears probable that one of the principal benefits of irradiation of molasses wort is in the formation of some growth-promoting substance in the substrate, which stimulates the yeast to a more sustained action and to more efficient utilization of the sugars present.

AGRICULTURAL METEOROLOGY

Climatological data for the United States by sections, [May–June 1933] (*U.S. Dept. Agr., Weather Bur. Climat. Data, 20* (*1933*), *Nos. 5, pp.* [*206*], *pls. 3, figs. 3; 6, pp.* [*200*], *pls. 3, figs 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Meteorological observations, [May–August 1933], C. I. GUNNESS, H. JENKINS, and F. R. SHAW (*Massachusetts Sta. Met. Ser. Buls. 533–536* (*1933*), *pp. 4 each*).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

SOILS—FERTILIZERS

[Soils and fertilizer studies in Kentucky] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 33, 34, 36–38, 42, 46–50, 51*).—Determinations of the iodine content of some of the more important soils and about 60 samples of limestone of the State are reported upon, as is also the station's work on nitrogen fixation in the soil, effect of various rotations and farm manure treatments on the soil supply of nitrogen, soil nitrate-nitrogen level and growth of White Burley tobacco, a method for calcium determination in plant extracts, rotation studies on the soil experiment fields, renewed fertilizer experiments, liming experiments, and phosphorus availability.

[Soils and fertilizer studies in Missouri] (*Missouri Sta. Bul. 328 (1933), pp. 4, 5–8, fig. 1*).—The report contains data on these subjects: The fineness of grinding limestone, by W. A. Albrecht; correlation between adsorbed ions and pasture vegetation, the effect of cultivation on the nature of soil colloids, utilization of adsorbed ions by plants, release of fixed potassium by lime, and the H ion in ionic exchange and hydration, all by H. Jenny, E. R. Shade, and E. Cowan; the influence of nitrogen fertilizer on crop growth, by M. F. Miller and R. L. Lovvorn; soil erosion, by Miller, L. M. Turk, and H. F. Rhoades; the measurement of phosphate deficiency of soils, by L. D. Baver; the size and stability of granules in various soil types, by Baver, Rhoades, and H. H. Krusekopf; the effect of different soil treatments upon bacterial activity in the soil, by Albrecht; soil plasticity and methods of improving heavy clay subsoils, both by Baver; water absorption by soil colloids, by Baver and G. M. Horner; the nitrogen and carbon accumulation or depletion of soils under different systems of treatment and management, by Miller and Albrecht; and fertilizer trials on pastures and soil experiment fields, by Miller, Krusekopf, Turk, and E. E. Smith, Jr.

Soil chemistry, W. H. MacIntire (*Tennessee Sta. Rpt. 1932, pp. 26–29*)—Findings are briefly summarized on lysimeter studies, the lime-magnesia problem, changes that phosphatic manures undergo in the soil, and the effect produced in a typical Tennessee soil by additions of Colorado soils.

[Soil studies in Texas], G. S. Fraps, J. F. Fudge, A. J. Sterges, A. H. Bean, Z. C. Foster, W. T. Carter, M. W. Beck, H. M. Smith, R. M. Marshall, E. H. Templin, and H. F. Morris (*Texas Sta. Rpt. 1932, pp. 13, 14, 85–88, 179*).—Brief notes on studies of soil fertility, nitrification, the soil surveys of Wheeler, Falls, Bee, Hardeman, Williamson, Cass, and Zavala Counties, and the use of artificial, cement-enclosed field plats.

[Soil investigations of the Vermont Station] (*Vermont Sta. Bul. 360 (1933), pp. 19–21*).—Results of further study of overliming injury (E.S.R., 68, p. 598), and an investigation into the requirements of Vermont pasture soils for potassic and phosphatic fertilizers are briefly noted.

An index for rating the agricultural value of soils, R. E. Storie (*California Sta. Bul. 556 (1933), pp. 44, figs. 17*).—The need for a method suitable for the comparison of the productive capacity of soils of characteristics so widely various as are those of California soils is emphasized, and the general value of such a soil rating or index in the classification and evaluation of land is noted.

The term "index for rating soils" is used to express a relative rating of productive capacity calculated from a study of the soil under field conditions. The rating is based on the study of three general factors: A, character of the soil profile (essentially those characteristics that determine the soil series); B, texture; and C, modifying conditions, such as drainage conditions, alkali, etc. Index numbers are used for each group of factors based on 100 percent expressing ideal conditions. The index is the product of the ratings given each of these three factors, A×B×C, the ratings and the final index being expressed in percentages.

"By the use of this method of rating soils, a large number of divergent types can be compared, or various tracts of land can be compared from the soil standpoint."

[Soil Survey Reports, 1928 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928 Nos. 30, pp. 29, fig. 1, map 1; 31, pp. 32, pls. 4, figs. 2, map 1*).—The two reports here noted present the results of surveys made with the cooperation of the Iowa and Texas Experiment Stations.

No. 30. *Soil survey of Crawford County, Iowa,* T. H. Benton and M. H. Layton.—Crawford County, western Iowa, occupies an area of 457,600 acres, shows the two distinct topographic features, (1) an upland plain cut by numerous streams and (2) level alluvial lands, and has a drainage system of which the "auxiliary branches and intermittent drainage ways penetrate all parts of the county."

The soils were found to constitute 7 series inclusive of 8 types, of which Marshall silt loam covered 73.7 percent of the total area surveyed and Wabash silt loam 23 percent.

No. 31. *Soil survey of Midland County, Texas,* E. H. Templin and J. A. Kerr.—Midland County, 577,280 acres of slightly undulating to flat plain, "with small minor depressions having no outlet", is located in western Texas. "The regional drainage of the county is imperfectly developed, the greater part of the run-off collecting in the many small intermittent lakes which occur throughout the county."

Six series of 15 types are mapped and described. Reagan gravelly loam, the most extensive type found, is one of a number described as "nonagricultural soils, adapted to use only as pastures", and constitutes 26.8 percent of the county. Springer fine sandy loam takes up 22.9 percent, and Reagan silty clay loam 13.2 percent.

Soil survey of the Nogales area, Arizona, T. W. Glassey (*U.S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1930, No. 6, pp. 32, fig. 1, map 1*).—The Nogales area, 62,080 acres of southern Arizona, includes all the agricultural lands of Santa Cruz County. The area "includes the long narrow valleys along Santa Cruz River and Nogales Wash, which range from a quarter of a mile to about 1.5 miles in width, with intervening and adjacent areas of desert and grazing lands."

Although 63.3 percent of the county consists of unclassified materials, of which 57.8 percent was rough broken and stony land and 5.5 percent river wash, there were also found 9 series inclusive of 17 soil types. The most extensive of these, Tumacacori sandy loam, amounts to but 5.1 percent of the area surveyed.

The survey was made in cooperation with the Arizona Experiment Station.

Soil Survey of Iowa.—Reports 69–72, P. E. Brown et al. (*Iowa Sta. Soil Survey Rpts. 69* (*1933*), *pp. 60, pl. 1, figs. 21; 70, pp. 64, pl. 1, figs. 19; 71, pp. 63, pl. 1, figs. 18; 72, pp. 62, pl. 1, figs. 17*).—These reports continue the series previously noted (E.S.R., 68, p. 159), dealing respectively with Pocahontas, Butler, Sac, and Calhoun Counties, and supplementing the Federal soil surveys (E.S.R., 67, p. 214; 66, p. 14; 68, p. 444; 69, p. 334) by including data obtained from greenhouse and field experiments and discussions of the needs of the various soils.

Soil survey of Erie County, New York, A. E. Taylor et al. (*U.S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1929, No. 14, pp. 52, fig. 1, map 1*).—Erie County, surveyed with the cooperation of the New York Cornell Experiment Station, lies at the western end of New York State and has an area of 670,080 acres. Of physiographic features the county includes those of parts both of the Allegheny Plateau and of the Interior Lowland; the central part of the county and its southeastern quarter being hilly, whereas the remainder of its land area forms level to gently rolling plains.

The soils of Erie County were found to be distributed among the 38 series of 77 types. The largest aggregate areas of individual types, those of Langford silt loam and of Schoharie silty clay loam, amount, respectively, to but 8 and 6.2 percent of the total area surveyed.

Soil and field-crop management for St. Lawrence County, New York, I, III (*New York Cornell Sta. Bul. 570* (*1933*), *pp. 4–29, figs. 15; pp. 50–52*).—These two parts, together with that noted on page 174, make up the bulletin.

Part 1, soils and field crops, by A. F. Gustafson, takes up the topography and drainage of St. Lawrence County, and, among other factors in the agricultural development of the county, its soils, their composition and lime needs, comparative land use and agriculture on four soil areas, crop adaptations, production and use of farm manure, fertilizer practice, fertilizer experiments, rotation of crops, and cropping plans and fertilization for grain and forage crops.

Part 3, soil map and soil-type descriptions, by F. B. Howe and Gustafson, describes the 33 soil types and 5 phases of types mapped in St. Lawrence County (E.S.R., 65, p. 417), noting their relative agricultural importance.

Relations between orchard soils and cover crops, R. C. Collison (*New York State Sta. Bul. 632* (*1933*), *pp. 18*).—The data presented, bearing on the relation of cover crops to soil nitrates, moisture, and organic matter production in the orchard, were collected during the past 16 years with soils and crops in large outside tanks from which the drainage was collected and examined.

Soil which grew alfalfa for 2 years and then lay bare for 2 years lost nitrogen equivalent to 450 lb. of nitrate of soda per acre per year for a 16-year average. During the years when the soil was cultivated but not cropped, nitrogen equivalent to from 587 to 1,835 lb. of nitrate of soda per acre per year was lost. Where a crop of barley and then one of wheat followed the alfalfa, the nitrogen losses were greatly reduced, amounting only to 136 lb. per acre per year. When timothy sod replaced alfalfa and the two grain crops followed the timothy, the nitrogen loss was still further reduced to the equivalent of only 51 lb. of nitrate of soda per acre per year. The nitrogen loss during the second year of alfalfa or timothy, when the stand was well established, was very small and of the same order for both crops, amounting only to 1.8 lb. of nitrogen per acre per year for alfalfa and 1.6 lb. for timothy. "This indicates that alfalfa may utilize soil nitrates as completely as timothy sod, and, if growing in orchards, the trees in both cases may have to be fertilized with nitrogen." It appeared that, after plowing down alfalfa or other legume crops, much nitrogen may be lost if these are not soon followed by another crop, and that nonleguminous cover crops could be used with advantage for this purpose.

Data on water relations of the crops in the tanks indicated that "the commonly accepted belief that a legume or nonlegume sod used as a cover in orchards, or an early seeded annual cover crop, seriously compete with the trees for moisture, is considerably exaggerated."

The sod-fertilizer system and the cultivation-cover crop system of orchard soil management are discussed and some of their similarities and differences emphasized. The use and value of legumes as orchard covers and the value of alternating them with nonlegumes in a cover crop rotation system are also considered.

Effect of covercrops on the soil solution at different depths under orchard conditions, E. L. Proebsting (*Hilgardia* [*California Sta.*], 7 (*1933*), *No. 14, pp. 553–584, figs. 2*).—Analysis of 0–2, 2–4, 4–6, and 6–8 ft. samples in several orchard plats at Davis, Calif., showed that: "The average of the 0–2 and 2–4 ft. samples confirms previously reported results [E.S.R., 63, p. 620].

"The NO_3 concentration in the 4–6 and 6–8 ft. depths under peaches and apricots is higher than that under pears and prunes, in contrast to the opposite situation in the surface of 4 ft. The NO_3 concentration in the 4–6 and 6–8 ft. samples is greatly reduced under alfalfa and winter cover crops as compared with clean-cultivated check plats. Plowing under alfalfa increased the NO_3

concentration strikingly in the surface 4 ft., but had little effect below that depth. Reseeding alfalfa caused a reduction of NO_3 to about the former level.

"The SO_4 concentration under peaches and apricots is higher in the 4–6 and 6–8 ft. samples than that under pears and prunes. The maximum SO_4 concentration is usually in the 4–6 ft. layer. In spite of additions of SO_4 by irrigation water, there has been little change in its concentration in the soil solution over the period studied.

"The HCO_3 concentration is higher in the 4–6 and 6–8 ft. samples than in the 0–2 and 2–4 ft. samples. The HCO_3 concentration is higher in the alfalfa and winter cover crop plats than in the checks.

"The chloride concentration is higher in the lower than the upper layers, with a maximum at 4–6 ft. The chloride concentration is higher under peaches and apricots than under pears and prunes, and lower under alfalfa than under clean cultivation.

"The PO_4 concentration is higher in surface than in deeper samples, with a minimum at 4–6 ft. There are no other significant differences, seasonal or from plat to plat.

"The calcium concentration varies in the same manner as that of NO_3.

"The magnesium concentration parallels that of calcium except that it is lower in the 0–2 ft. and higher in the 6–8 ft. samples than that of calcium.

"The potassium concentration decreases with depth, but otherwise does not vary significantly."

Factors affecting the accumulation and loss of nitrogen and organic carbon in cropped soils, R. M. SALTER and T. C. GREEN (*Jour. Amer. Soc. Agron., 25 (1933), No. 9, pp. 622–630, figs. 4*).—This contribution from the Ohio Experiment Station records and analyzes data on the nitrogen and organic carbon contents of fertility plat soils from both rotation and continuously cropped plats.

It is estimated that a single year's cropping to the various crops has increased or decreased the organic carbon content of the soil by the following percentages of the total: Corn, −3.12; wheat, −1.44; oats, −1.41; hay in 5-year rotation (timothy predominating), +1.36; hay in 3-year rotation (clover), +3.25. The corresponding values for nitrogen are: Corn, −2.97; wheat, −1.56; oats, −1.45; hay in 5-year rotation, +0.64; hay in 3-year rotation, +2.87.

The quantities both of organic carbon and of nitrogen in fertilized plats of the 5-year rotation experiment were found after 32 years cropping to be highly and positively correlated with the total crop production of these plats. The regressions were apparently linear, and from the corresponding equations the quantities of nitrogen and carbon calculated for zero crop production were interpreted as the quantities that would have been found had the same cultural practices been employed but no residues whatever returned.

"By comparing the composition of fertilized and unfertilized plat soils of the Ohio experiments, it is concluded that residues from the corn crop were of little value in conserving soil nitrogen or organic matter, those from oats were notably effective, and those from wheat intermediate in value. Of the nitrogen and organic carbon conserved during 32 years in the soil of a liberally manured plat in the 5-year rotation, it was estimated that about one half on the limed end and three fifths on the unlimed end was attributable to residues from the larger crops grown, the remainder being residual from the manure itself."

Character and behavior of organic soil colloids, M. S. ANDERSON and H. G. BYERS (*U.S. Dept. Agr., Tech. Bul. 377 (1933), pp. 32*).—A study of the organic matter of soils from the colloidal standpoint is reported, organic colloids having been prepared from various soil-forming materials, such as rotted hay and straw, leaf mold, bacteria and fungus bodies, peats, and soil sources.

Chemical analyses of these colloids showed the lignohumic complex to be the largest component. The electrodialyzed colloids were strongly acid. In terms of milliequivalents, they required for neutralization less of NaOH than of ammonia in the form of dilute NH_4OH. The material absorbed (over 30 percent H_2SO_4) more water vapor than did many of the active inorganic colloids. Organic colloids mixed with quartz flour showed a moderate decrease in ammonia-absorbing power. The acid qualities of organic colloids were not much diminished by mixing them with ferric hydroxide, were much more diminished by mixing them with aluminum hydroxide, and were almost entirely neutralized by mixing them with ferrous hydroxide.

"From certain soils considerable organic matter may be dissolved by the action of acids in moderate concentration. There is evidence that much of the organic matter thus dissolved is in the form of organic cations."

Soil fertility studies, M. Nelson (*Arkansas Sta. Bul. 290 (1933), pp. 36*).—The results of 4 series of trials of a 4-year rotation carried through 3 cycles in the years from 1921 to 1932, inclusive, are here reported, the work having been so arranged that one crop each of corn, oats, wheat, and clover were included each year, with the exception of the substitution either of soybeans or of cowpeas for clover failures. A part of the detailed statement of the results of these trials and of the interpretations placed upon them is as follows:

"Some of the results from the use of soil amendments and fertilizer materials were: From lime, no positive results; from superphosphate, moderate increases in yields of cereal crops and large increases in yields of red clover hay. Averaged increases from superphosphate alone were: Corn 5.1 bu., oats 7.9 bu., wheat 4.7 bu., and clover hay 1,765 lb.; from nitrogen, low increases in yield when used alone, but better returns when combined with superphosphate for cereal crops and without favorable effects upon red clover; from potassium alone low returns usually. Rock phosphate in comparison with superphosphate was about 60 percent effective.

"The effects of phosphorus upon the production of clover was outstanding. Check plats receiving no fertilizer of any kind rarely produced stands of clover. Check plats receiving manure once in 4 years produced poor stands of clover in at least half the seasons. Plats receiving phosphorus usually produced good stands and high yields. Potassium and nitrogen supplementing phosphorus resulted in some improvement in stand and early growth of clover, but had small effects upon the final yields. Winter-killing of clover took place occasionally on check plats but did not occur where phosphorus was applied. . . .

"Apart from the increases in yields resulting from manure or from any treatment supplementing manure in any given season or for the 12-year period, there are positive indications of increasing the yielding capacity in both manured check plats and trial plats receiving applications of commercial materials in addition to the manure."

Maintaining fertility of Grande Ronde Valley soils, W. L. Powers and D. E. Richards (*Oregon Sta. Bul. 311 (1933), pp. 23*).—In a combination rotation of 4 crops grown for 12 years on 4 ranges, each of 13 plats laid out on unirrigated Catherine silt loam for 9 distinct treatments and 4 checks, profitable crop response was obtained (1) from the use of land plaster or of sulfur in alfalfa growing and (2) from the use of superphosphate for grains.

Preliminary results from 19 crop rotations maintained for 8 years indicated that rotating with legumes, such as peas, or the use of annual sweetclover with spring wheat will increase the yearly income.

A key to Grande Ronde Valley soil types is presented; and drainage and irrigation requirements, chemical analyses, management, and maintenance are discussed.

The results of twenty years complete soil fertility tests at Brookings, S. D., J. G. Hutton (*South Dakota Sta. Bul. 280 (1933), pp. 20, figs. 9*).—This bulletin records the results of 20 years' experiments with nitrogenous, phosphatic, and potassic fertilizers, applied singly and in combinations on Barnes sandy loam cropped to two rotations including corn, wheat, oats, barley, and red clover.

On this soil phosphatic fertilizer used alone gave the greatest all-crop increase, producing a general yield 38.08 percent greater for the entire period of the experiments than that obtained from the untreated soil. In terms of total weight of crops the phosphate treatment increased the yield practically 1 ton per acre per year. "Phosphorus must be applied if the fertility of the soil is to be maintained.

"The application of nitrogen and potassium, either singly or in combination with the other elements, has not paid for the expense involved."

Investigations in the use of nitrate of soda for field crops, M. F. Miller and R. L. Lovvorn (*Missouri Sta. Bul. 327 (1933), pp. 31, figs. 16*).—The effects of sodium nitrate applied in various ways in field experiments on general farm crops, pasture experiments, greenhouse experiments, and special trials of the protein-producing possibilities of nitrate applications were studied during a 5-year period.

Treatment of corn about 1 ft. high with 100-lb. per acre side dressings of sodium nitrate was fairly satisfactory, but "the 50-lb. side dressing was too small to give satisfactory returns." Treatment of wheat with 200 lb. per acre of a 4–12–4 fertilizer gave an average increase of 3 bu. per acre over the yield produced by 200 lb. of 0–12–4. Early spring top dressings of 50, 100, or 150 lb. of sodium nitrate, following a fall application of 200 lb. of the 4–12–4 mixture, added 3⅓, 5½, and 5½ bu. per acre, respectively, to the yields. Sodium nitrate was most effective for timothy when applied as a spring top dressing.

For pastures of medium and poor quality the mixture 6–12–0 was an effective treatment, this mixture followed by "moderate nitrate top dressings" being the best treatment found for the poor pasture.

"No significant increases in the protein content of corn, wheat, or timothy hay were secured from the nitrate applications used in these field experiments. It is evident that the applications were too small to bring about such changes. . . . The increase in the protein content of the pasture herbage from the use of heavy nitrogen applications was quite significant, averaging about 3 percent from the heavier applications and bringing a maximum of 19 percent total protein in the case of the medium pasture grass and 15 percent for the poor pasture grass.

"Special investigations designed to determine the influence of very heavy applications of nitrate on the protein content of crops gave little return on corn or soybeans in the field. In case of corn plants grown in the greenhouse, however, the protein content (nitrogen × 6.25) was increased from about 3 to 10¼ percent for the corn on one soil type and from 3⅓ to 8¾ percent for the corn on another soil type, when heavy nitrate applications were made at the time the corn was a foot high. A similar maximum protein percentage was reached when the heavy nitrate applications were made at the time the corn was 2 ft. high.

"A special single-season experiment, designed to determine the effect of heavy applications of nitrate as a top dressing on a timothy meadow in the spring, brought a maximum increase of 2 tons of hay where the nitrate was applied early and the hay harvested at the blooming stage. However, in this case applications up to 1,200 lb. of nitrate showed little increase in the protein content of the hay. When heavy applications of nitrate were made in the spring and the hay cut in the booting stage, the increase in the hay yield was approximately 3,500 lb. and the protein content reached 15.22 percent as compared with 8.35 percent in the hay from the untreated plat. Heavy applications of nitrate made in the booting stage gave small increases in yield when the hay was cut at the blooming period, but the protein content was increased to about 12 percent. On the whole it appears that the heavier nitrate applications applied early may markedly increase the hay yield even when the crop is cut in the booting stage, while the protein content may be increased to approximate that of legumes."

Experiments with phosphate fertilizers on Montana soils, E. Burke, I. J. Nygard, and W. McK. Martin (*Montana Sta. Bul. 280 (1933), pp. 52, figs. 12*).—This bulletin continues the record of experiments already reported upon (E.S.R., 67, p. 370).

Residual effects of 1931 phosphate treatments increased wheat and oats yields by 10 and by 12 bu., respectively. Alfalfa still showed in 1932 a favorable effect of the 1930 additions of 125 and of 200 lb. per acre of treble superphosphate, the second year response being greater than that observed in the season during which the fertilizer was applied.

Treble superphosphate increased the yield of canning peas as much as 976 lb., the yield of seed peas significantly, and the yield and phosphorus content of hay grown on native meadows in an area where cattle were afflicted with bone-chewing.

Ammonium phosphate was more effective than treble superphosphate for potatoes grown under irrigation.

Finely ground rock phosphate applied in the spring of 1932 at the rate of 560 lb. per acre gave no significant increases in yields of alfalfa, wheat, and potatoes, and only a slight increase in the yield of sugar beets; whereas treble superphosphate applied at the rate of 150 lb. per acre and at the same time to adjacent plats of the same fields gave large increases in yields of alfalfa and sugar beets and significant increases in yields of wheat and potatoes.

The effects of acidifying amendments on impermeable soils, C. W. Botkin (*New Mexico Sta. Bul. 210 (1933), pp. 18*).—Rather heavy applications of gypsum, ferrous sulfate, aluminum sulfate, ammonium sulfate, sulfur, acid phosphate, manure, and sodium nitrate were tried for three years on unproductive Gila clay loam, all plats being subsoiled in the fourth year to a depth of about 14 in., while cotton irrigated with a total of about 16 in. of water was used as a test crop in each year of the experiment.

The percentage of alkali (soluble salts) decreased somewhat in the 0- to 8-in. horizon, although there was an increase in the total alkali to a depth of 32 in. The alkalinity as indicated by the pH values decreased in the 0- to 8-in. horizon of the plats treated with acidifying amendments, and laboratory tests showed a decided improvement in the permeability of this horizon, but the lower levels either were not changed or were only slightly affected.

There were large seasonal variations in the yield of cotton but no significant correlations with the amendments, with the concentration of alkali, or with the H-ion concentration. The soils remained dry below the 20-in. horizon.

There was no appreciable increase in the yield of cotton attributable to any of the amendments.

"The low permeability and productivity of these soils are apparently caused by a high content of replaceable sodium in the upper horizon and by a hardpan formed largely by cementing calcium compounds in the lower levels. In improving the soils it is necessary to break up the hardpan mechanically or by solution and to displace a considerable portion of the replaceable sodium. Gypsum is the cheapest and most effective amendment for replacing sodium. This amendment may be mixed to plow depth by the usual methods of cultivation and to somewhat greater depths by subsoiling, but lower levels must be reached, and, for this, one is apparently dependent on the movement of water and soluble calcium when the soils are subjected to prolonged irrigation."

Grades of peat and muck for soil improvement, A. P. Dachnowski-Stokes (*U.S. Dept. Agr. Circ. 290 (1933), pp. 31, figs. 8*).—This circular describes the distribution and characteristic physical properties and chemical composition of the principal types of peat in the United States; compares the possibilities of several different kinds of peat for improving specific conditions of a mineral soil; and emphasizes the importance of establishing classification and uniform grading systems for domestic peat to avoid waste and aid satisfactory industrial development of this product, now largely imported from European countries.

"In general, it may be stated that the use of fibrous and partially decomposed grades of domestic peat, well mixed with a mineral soil, will result in a general increase in plant growth when cognizance is taken of the particular nutrient demands of the plants. In regions where mineral soils contain lime and soluble salts or where rainfall during the summer months is often light and there is danger of drought, an application of poorly decomposed, shredded moss peat or reed and sedge peat added to light sandy soils or to heavier soils such as silt and clay will do much to improve their structure and moisture-holding capacity.

"On the other hand, in regions where the growing seasons are short and the climatic conditions are cool and humid, it is of greater importance that grades of peat or muck, dark in color and more or less advanced in degree of decomposition, be used. The soil mixtures are usually less retentive of moisture, better drained, and definitely warmer, and they can be worked earlier in the spring."

Analyses of commercial fertilizers, R. N. Brackett and J. H. Woodward (*South Carolina Sta. Bul. 291 (1933), pp. 55*).—The bulletin consists of the usual report of routine fertilizer analyses for the 1932–33 season.

Commercial fertilizers, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 361 (1933), pp. 20*).—This report (E.S.R., 68, p. 309) of the annual fertilizer analysis data notes that every brand licensed was again "in the so-called 'high analysis' class, carrying 14 percent or more of plant food." Also the shortage in total plant food exceeded 3 percent in only two cases, and "safe overruns were the rule."

AGRICULTURAL BOTANY

Handbook of agricultural bacteriology, F. Löhnis.—I, pt. 1, Bacteriology of feeding stuffs. II, pt. 1, Farm manures, rev. by G. Ruschmann (*Handbuch der landwirtschaftlichen Bakteriologie. Band I, Teil 1, Futtermittelbakteriologie. Band II, Teil 1, Düngerbakteriologie. Berlin: Borntraeger Bros., [1933], 2. ed., rev., vol. 1, pt. 1, pp. 105, figs. 2; vol. 2, pt. 1, pp. 158, figs. 2*).—These parts of a revision of the handbook previously noted (E.S.R., 23, p. 720) deal, respectively, with the bacteriology of feeding stuffs and farm manures.

The stability of cultures of Rhizobium, L. Almon and I. L. Baldwin (*Jour. Bact., 26 (1933), No. 3, pp. 229–250*).—At the University of Wisconsin six aberrant cultural types, most of them chromogenic, were developed from single cell cultures of the recognized normal form of *R. trifolii* by altering the conditions for growth and by cultivation of culture filtrates by the Hauduroy technic. Evidence for relationship among the aberrant types and the original form was drawn from experiments in which the types were caused to change from one to another. Attempts were made to derive the original form from the aberrant ones, with success in only two instances.—(*Courtesy Biol. Abs.*)

The production of tyrosinase among various species of Rhizobium and related organisms, L. Almon and E. B. Fred (*Zentbl. Bakt.* [*etc.*], *2. Abt.*, 88 (*1933*), *No. 13–16, pp. 302–304*).—One hundred and eighty-one cultures were tested at the Wisconsin Experiment Station by two methods for tyrosinase production. The two methods showed good qualitative agreement but resulted in quantitative discrepancies. Of the root nodule bacteria, some cross inoculation groups, notably the bean, alfalfa, and soybean groups, showed higher percentages of cultures producing this enzyme than did the others. The behavior of all 17 cultures of radiobacter tested on the tyrosine-asparagine-mannitol agar was very uniform. A buff coloration of the medium was shown after four weeks' growth.

On the formation of fructose and kojic acid by acetic acid bacteria, T. Takahashi and T. Asai (*Zentbl. Bakt.* [*etc.*] *2. Abt., 88* (*1933*), *No. 13–16, pp. 286–295*).—Acetic acid bacilli isolated from various fruits formed fructose and kojic acid from mannite, and some of them produced fructose even over 80 percent of theoretical yield. It seems highly probable that mannite is oxidized to fructose, which is further converted into kojic acid. The mode of the formation of kojic acid by these bacilli is quite different from that by *Aspergillus*. Production of kojic acid seems to be limited to some special varieties of acetic acid bacilli.

A vitamin necessary for the growth of B. sporogenes: Its relation to auxin and other growth factors, C. J. G. Knight and P. Fildes (*Brit. Jour. Expt. Path., 14* (*1933*), *No. 2, pp. 112–124*).—A factor, comparable to a vitamin, necessary for the growth of *B*[*acterium*] *sporogenes* is described. Chemical tests on the purified substance indicate that it may be a phenolic acid. Active extracts containing the vitamin can be obtained from many sources, in fact from almost any living material. It is synthesized by *B. aertrycke*, *B. tuberculosis*, and *Aspergillus versicolor*, and it is improbable that the vitamin is specific for *B. sporogenes*. In its distribution and properties it shows a striking relation to auxin and to other factors that have been described as affecting the growth of plants and other forms of life.—(*Courtesy Biol. Abs.*)

Action at a distance by metals on microbes [trans. title], G. A. Nadson and C. A. Stern (*Zentbl. Bakt.* [*etc.*], *2. Abt., 88* (*1933*), *No. 13–16, pp. 320–334, pl. 1, figs. 5*).—Pure cultures of yeasts (*Saccharomyces cerevisiae*) and of bacteria (*Bacterium prodigiosum* and *B. ponticum*) were submitted to the action of plates of various metals (Mg, Al, Ni, Cu, Ag, Sn, Pt, Au, and Pb) at a distance of from 1 to 3 mm from the cultures and separated from them by a stratum of air. Results showed that the metals act at a distance, exerting an influence on the development of the micro-organisms. Moreover, their action follows a definite law; the bacterial effect increases with atomic weight of the metal used.

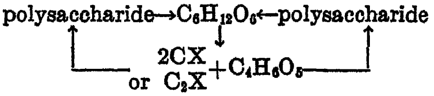
According to the hypothesis proposed by the authors, the action of metals at a distance is due to the electrons issuing from them. The electrons bombard the micro-organisms, killing a part and attenuating or modifying the properties of the others.

Choline metabolism in plants, I, II [trans. title], G. Klein and H. Linser (*Biochem. Ztschr., 250* (*1932*), *No. 1–6, pp. 220–253, figs. 13; 260* (*1933*), *No. 1–3, pp. 215–225, figs. 13*).—Following a compilation of the literature, part I outlines methods for choline determination and reports analyses for choline and lecithin of various plants and plant organs. Etiolated seedlings were found to contain more water soluble choline and less lecithin choline than green seedlings.

Determinations on seedlings (green and etiolated), leaves, twigs, husks, and seeds of *Pisum sativum*, *Soja hispida*, *Triticum sativum*, *Zea mays*, and *Phaseolus*, reported in part II, show the change in choline and lecithin choline content with growth. Choline is the precursor of lecithin choline. The latter is freely shifted from organ to organ, as from the leaves to the branches and vice versa. Free choline exceeds bound choline at all times.—(*Courtesy Biol. Abs.*)

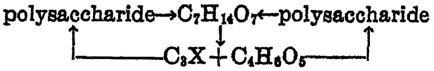
The rôle of the organic acids in plant metabolism, I, II, T. A. Bennet-Clark (*New Phytol., 32 (1933), Nos. 1, pp. 37–71, figs. 3; 2, pp. 128–161, figs. 8*).—In part 1, three groups of plants are distinguished, (1) those containing malic acid formed from carbohydrates in darkness and converted into it in the light; (2) those in which the young parts contain chiefly malic acid, but in which oxalic acid appears and malic acid disappears as the plants become older; and (3) oxalic-acid-containing plants. The fleshy fruits are invariably rich in acids of the malic or citric acid groups, and as ripening (senescence) of the fruit advances the acid disappears, but "investigation of the acid metabolism of fruits has so far failed to throw light on the chemical mechanism or significance of the process."

In part 2 it is pointed out that for each molecule of sugar converted to acid two atoms of carbon must be converted into some other substance or substances. It does not reappear as CO_2. Accumulations of other acids are not found in the tissues of the Crassulaceae, so it appears that 1-, 2-, or 3-C compounds, formed simultaneously from sugar, are built back again into polysaccharide. Direct evidence also shows that considerable quantities of malic acid are converted into compounds other than CO_2, which again suggests that this acid is converted into polysaccharide. The following, from which CO_2 has purposely been omitted, are suggested as the probable reactions involving sugars and malic acid:



$$\begin{tikzcd}
\text{polysaccharide} \arrow[r] & C_6H_{12}O_6 \arrow[d] & \text{polysaccharide} \arrow[l] \\
& \genfrac{}{}{0pt}{}{2CX}{\text{or } C_2X} + C_4H_6O_5 \arrow[ul] \arrow[ur] &
\end{tikzcd}$$

or,



$$\begin{tikzcd}
\text{polysaccharide} \arrow[r] & C_7H_{14}O_7 \arrow[d] & \text{polysaccharide} \arrow[l] \\
& C_3X + C_4H_6O_5 \arrow[ul] \arrow[ur] &
\end{tikzcd}$$

Carbon dioxide is regarded as originating from some intermediate product in the conversion of sugar into malic acid.—(*Courtesy Biol. Abs.*)

An apparatus for determining the absorption of carbon dioxide by leaves under natural conditions, A. J. Heinicke and M. B. Hoffman (*Science, 77 (1933), No. 1985, pp. 55–58, fig. 1*).—The equipment described in this paper was designed primarily for studies involving a large number of determinations of the photosynthetic activity of apple leaves under field conditions. The chief features are, first, a simple CO_2 absorption unit which can be made up of standard glassware and which is efficient even though the air passes through the liquid at a rapid rate, and, secondly, a lightweight, closely fitting leaf chamber made of cellophane, which is easily attached and held in place without cumbersome supports.—(*Courtesy Biol. Abs.*)

Vernalization or Lyssenko's method for the pre-treatment of seed, R. O. Whyte and P. S. Hudson (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth],* *Bul. 9 (1933), pp. 27, pls. 2, fig. 1).*—Lyssenko and his coworkers claim that the plant is all through its life susceptible to those influences which determine its passage from one phase to another of its vegetative cycle. Thus the influences which determine its passage to the reproductive phase can just as well be applied to a young seedling as to the older plant. This is the essence of the method, which consists in inducing the seed to start germinating and before the seed coat is ruptured to subject this "seed", which already constitutes the growing plant, to those conditions of light, temperature, etc. (according to species and variety) which it requires in order to enable it to reproduce. After this the plant will complete its reproductive cycle regardless of whether these conditions are further supplied or not.

By the aid of the method it has been possible to bring winter wheat to maturity in northern latitudes where only spring wheat can normally be grown, and many other experiments of a similar nature are reported, including the treatment of potato tubers by continuous illumination before planting, after which tuber formation occurred in northern latitudes not normally suited to potato growing.

By combining these methods with ordinary breeding it is hoped to produce new races of plants which react in the ways described without the necessity of pretreatments.—(*Courtesy Biol. Abs.*)

Absorption and movement of plant nutrients, H. C. Henricksen (*Puerto Rico Sta. Agr. Notes 60 (1932), pp. 1–3*).—Using lithium nitrate, a chemical closely related to potash and sodium but not ordinarily found in appreciable quantities in plants, the author found by spectroscopic examination that lithium can enter the bark of large citrus roots devoid of fibrous roots, thus indicating that the citrus tree is not entirely dependent upon its fibrous roots. Leaves sprayed with lithium nitrate solution did not absorb the chemical. Lithium was found in leaves and branches from 25 to 30 ft. distant from the point of application 72 hours following application.

The influence of colloids on the growth of some cultivated plants [trans. title], B. Niklewski (*Jahrb. Wiss. Bot., 78 (1933), No. 3, pp. 431–482, figs. 27*).—The author and associates have studied the influence of colloidal materials, such as humus extracts, manure extracts, and metallic colloids, on the growth of seedlings of different species of beets and mustard in a long series of greenhouse and field tests (E.S.R., 66, p. 319). Stimulation of growth of the root system was found in every case. This was independent of the nature of the colloid itself, and not due to its content of mineral salts but to a favorable effect upon the ionic concentration of the cell contents. The latter, in turn, is believed to be due to increased permeability of the cell plasm, resulting from contact of the colloidal material with the root hairs of the plant. Marked stimulation of root hair development was observed as a result of the addition of any kind of colloidal material to the culture medium.

The author believes that the beneficial results of adding organic colloidal materials to soils are due to stimulation of root growth by increasing the permeability of cell protoplasm.—(*Courtesy Biol. Abs.*)

Effect of several environmental factors on the hardening of plants, S. T. Dexter (*Plant Physiol., 8 (1933), No. 1, pp. 123–139, figs. 5*).—Hardening proceeded markedly in the dark in alfalfa or winter wheat plants having an abundant storage of organic food, if the temperature was near 0° C. The more succulent wheat plants grown in the greenhouse gave no indication of hardening in the dark at 0°, but hardened rather completely when illuminated. Alternating temperatures did not particularly favor hardening in either light or dark. A short period with light at a higher temperature was not especially deterrent in the hardening process, except with winter wheat. With a longer day at the higher temperature for both alfalfa and wheat, and perhaps with cabbage and tomato, elongation of foliar parts was especially evident. Winter wheat was affected much more adversely in its hardening behavior than alfalfa, cabbage, or tomato by a short period at a higher temperature. Exposure to a long day in the hardening room at 0° gave no indication of the usual response in wheat and alfalfa of decided elongation of parts. On the contrary they hardened more fully than with a short day. Winter wheat plants receiving a short day in the greenhouse (60° F.) hardened more rapidly and more fully in the cold room than similar long-day plants under either a long- or a short-day hardening treatment. The short-day plants were smaller, greener, and somewhat higher in dry matter.

When winter wheat, alfalfa, tomato, and cabbage plants were hardened in several ways which would favor photosynthesis and decrease respiration, or the reverse, removal of carbon dioxide from the air given the plants prevented or greatly depressed the degree of hardening. Plants receiving their light in a warm room and their dark period in a cold room were always hardier than those receiving the opposite treatment. The first would seem to favor photosynthesis and depress respiration, while the second would tend to use the reserve foods of the plant without replenishment. Alternating temperatures, per se, without illumination did not appear to aid in the hardening of the plants. When marked top growth occurred, even under conditions favoring photosynthesis and depression of respiration, hardening was lessened.

Although the various species differed considerably in behavior, it appeared that the development and maintenance of a high available carbohydrate supply with much retarded vegetative growth is essential before the cold-temperature reaction of hardening of plants will occur in an efficient manner.

The effect of temperature on the geotropism of seedlings of Lathyrus odoratus, L. E. Hawker (*Ann. Bot.* [*London*], *47* (*1933*), *No. 187, pp. 503–515, figs. 4*).—Geotropic presentation time and latent time for the epicotyl of *L. odoratus* were found to decrease with increase in temperature up to 30° C., after which they increase rapidly. Temperature has a greater effect on presentation time in epicotyls of maximum sensitivity (6–10 cm long) than in younger epicotyls or in slightly older epicotyls. The rate of fall of statolith starch increases up to 30° and then rapidly decreases, showing a close correlation with sensitivity to gravity. Growth at a low temperature (i.e., 5°) reduces sensitivity to gravity even when the seedlings are restored to a temperature of 20° or 30°. The statolith apparatus is also reduced by growth in the cold. Twenty-four hours in the cold reduces sensitivity to gravity even when the seedlings are restored to a temperature of 20° for 24 hours before stimulation, but the effects of the 24 hours' cooling do not remain after 48 hours at the higher temperature. Evidence is given that the effect of 24 hours' cooling is to reduce the supply of growth hormone. It is suggested that the fall of the statoliths in some way brings about the redistribution of growth hormones in the stimulated organ, which has been shown to precede curvature.

Effect of somatic injury upon yield in corn, M. Steggerda (*Plant Physiol.*, *5* (*1930*), *No. 3, pp. 432–435*).—Corn plants which have been mutilated by incisions or leaf removal produce less grain per ear than uninjured plants.

Wind and sand injury to leaves and fruits, R. F. Poole (*Jour. Elisha Mitchell Sci. Soc.*, *49* (*1933*), *No. 1, pp. 171–175, pls. 2*).—Stating that wind and sand storms cause much injury to the leaves and fruits of many plants, the author in this contribution from the North Carolina Experiment Station illustrates injury to the peach, apple, grape, and tobacco and discusses the nature of the damage and means of prevention. Torn leaves appeared to callus quickly and to be no more susceptible to fungi than uninjured leaves. Bacterial parasites were in the case of cotton and the peach more harmful to the injured leaves, and injured fruits proved more susceptible to decay. Evergreen windbreaks were effective in diminishing injury.

GENETICS

The general formula of heredity, H. H. LAUGHLIN (*Natl. Acad. Sci. Proc., 19 (1933), No. 8, pp. 787–801, figs. 4*).—A theoretical general formula for heredity is presented, based on various geometric considerations from which specific formulae have been worked out for the inheritance of speed in race horses and stature in man. It is considered that this presents an accurate mathematical picture of how nature transmits a measured hereditary quality from one generation to another and through the evolutionary process.

The effect of aging and heat on the chromosomal mutation rates in maize and barley, F. H. PETO (*Canad. Jour. Res., 9 (1933), No. 3, pp. 261–264*).—Observations on the mutation rate of corn grown from seed of various ages corroborated the finding of Navashin that the chromosomal mutation rate in *Crepis* was influenced by aging of the seed. A very high chromosomal mutation rate in barley was induced by heating seed under various humidity conditions, the most common type of aberration appearing to be fracture of the chromosomes either at the attachment constriction, the secondary constriction, or the point of attachment of the trabants. Reattachment of fragments to other chromosomes was observed in two cases. The discovery that a large proportion of the mutant cells are eliminated during the growth of the plant seemed to be significant.

Plastid studies in genetic types of maize, argentia chlorophyll, W. H. EYSTER (*Plant Physiol., 8 (1933), No. 1, pp. 105–121, figs. 12*).—The argentia chlorophyll pattern in corn, according to genetic and physiologic studies at Bucknell University, results from the more rapid development of the chloroplastids in the cells adjacent to the vascular bundles, and its expression is influenced by temperature. This pattern is inherited as a simple Mendelian recessive and is the expression of a gene (*Ar*), which has its locus in the *C–Sh–Wx* chromosome at 10.81 cross-over units to the right of the locus of *Wx*. Argentia seedlings have less total chlorophyll than green plants of the same genetic constitution, although the chloroplastid pigments occur in the same proportion. While removal of the endosperm when the first leaf is exserted from the coleoptile greatly reduces chlorophyll content in green plants, it does not affect chlorophyll content in argentia plants.

The inheritance of some plant colors in cabbage, R. MAGRUDER and C. H. MYERS (*Jour. Agr. Res. [U.S.], 47 (1933), No. 4, pp. 233–248*).—All F_1 plants of a cross between magenta, a previously undescribed type, and sun color were purple, and the F_2 was comprised of approximately 9 purple: 3 magenta: 3 sun color: 1 green. Data from back crosses by the F_1 and F_2 color types with the double recessive green, behavior of F_2 color types in F_4 generations, and progenies of intercrosses between F_2 color types as well as results from a cross between magenta and an unrelated pure green, indicate that purple results in this case from the interaction of two independently inherited factors or genes. The following genetic formulas are proposed for the respective color phenotypes: *SM*=purple, *Sm*=sun color, *sM*=magenta, *sm*=green. The existence of all possible genotypes of these phenotypes has been demonstrated.

The red and purple pigments are contained in the cell sap of one and not more than two layers of the nearly round cells of the spongy mesophyll adjacent to the layer of colorless, cutinized epidermal cells.

Genetic relations of red plant color, leaf shape, and fiber colors in upland cotton, J. O. Ware (*Arkansas Sta. Bul. 294* (*1933*), *pp. 60*).—Cotton plants with green plant color, normal leaves, and green lint were crossed with plants having red plant color, okra-shaped leaves, and white lint, and the crosses were variously studied into the F_4 generation. See also previous notes (E.S.R., 62, p. 27; 64, p. 428; 67, pp. 24, 25; 68, p. 33).

The plants in F_1 were all rather uniformly intermediate for each of the three characters, and the F_2 segregated into 27 classes exhibiting all the genotypes. The F_3 and F_4 generations were grown, respectively, on the basis of F_2 and F_3 genotypes. These genotypes in both generations, whether heterozygous for 3, 2, or 1 pair of factors, segregated according to expectation. The genotypes homozygous for 1, 2, or 3 pairs of characters bred true for all cases where homozygosity prevailed.

The F_2 data, where the 3-character pairs for plant color, leaf shape, and lint color were studied as a trihybrid or when any 2 of the 3 characters were studied as dihybrids, the back-cross studies of the 3 possible 2-character combinations of the 3, and the F_2 and F_3 genotypes either segregated for 3- or 2-character pairs in the following generation, all furnished evidence that red plant color, okra-shaped leaf, and green lint color are independently inherited characters.

Inheritance of awn development in Sonora wheat crosses, K. S. Quisenberry and J. A. Clark (*Jour. Amer. Soc. Agron.*, *25* (*1933*), *No. 7, pp. 482–492, fig. 1*).—A cross between Sonora and Quality, both awnleted wheats, produced in F_2 a complete range of segregation from awnless to awned. In F_3 true-breeding awnless and awned strains were obtained, as well as strains awnleted like both parents, and there was also a wide range of segregating groups. Sonora was assumed to contain the genetic factors *aaBB* and Quality *AAbb*, whereas awnless segregates and *AABB* and awned ones *aabb*. The segregation in F_2 and F_3 from a Supreme×Sonora (awnless) cross indicated a single genetic factor difference, Supreme being assumed to be *AABB*. Segregation in Sonora×Reliance could not be explained completely by a single major factor difference. Reliance was assumed to be *aabb*, although a minor genetic factor appeared to be operating.

[Studies in animal genetics and reproduction at the Texas station] (*Texas Sta. Rpt. 1932, pp. 23, 24, 192–194*).—Studies of the inheritance of the ridgling characteristic (B. L. Warwick) and type of lock in goats (J. M. Jones, Warwick, and W. H. Dameron); and the polled character in fine-wool sheep (Warwick, Jones, Dameron, and P. B. Dunkle); and type and conformation in fine-wool sheep (Jones, Warwick, Dameron, and S. P. Davis) were continued (E.S.R., 67, p. 665).

The diploid chromosome number of goats was 60. Embryos produced by crossing rams with goats are described by Warwick, R. O. Berry, and W. R. Horlacher.

The multinipple trait in sheep and its inheritance, E. G. Ritzman (*New Hampshire Sta. Tech. Bul. 53* (*1933*), *pp. 32, figs. 4*).—An analysis of the multinipple characteristic in sheep is presented, based on the results of matings between the multinipple sheep at the station and the Alexander Graham Bell flock. The numbers of nipples are reported for the 54 lambs produced in matings of 6-nippled rams with 2-nippled ewes and for the 27 lambs produced in matings of 2-nippled rams with 6-nippled ewes.

The results obtained were best explained as due to the action of three doses each of two pairs of factors, each of the three doses having equal effect on the primary factors. This hypothesis was applied to selected back-cross and other data and was found to agree closely with the results obtained. There was apparently no sex-limited effect, but the degree of expression of the multinipple character was modified by sex since it was more pronounced in females than in males.

As the factors for multinipples are cumulative, the development of a high-milking strain, relatively pure, seems a simple matter.

Hair color inheritance in long-legged terriers [trans. title], W. K. HIRSCHFELD (*Züchter, 5 (1933), No. 6, pp. 141–144, figs. 2*).—Crosses of airedale, Irish, and hound-marked fox terriers indicated that there was a single unit factor difference between the colors of the breeds. Crosses of airedales and fox terriers produced 9 black-blazed F_1s, which, mated back to fox terriers, produced 8 with black-blaze and 8 with black-blaze and white markings. The red color in the fox terrier×red Irish terrier mating was found to be dominant. The factor for self color and two colors without white was operative, the former being dominant.

[Studies on the physiology of reproduction] (*Missouri Sta. Bul. 328 (1933), pp. 13, 14*).—Brief reports are given of investigations on the function of the dartos muscle in the ram, abnormal spermatozoa in the semen of boars, influence of diet and hormones on mating desire in aged rams, and influence of temperature and feed on the onset of oestrum in ewes, by F. F. McKenzie and R. W. Phillips; the development of the nervous system and alimentary canal in sheep embryos, by McKenzie and F. H. Woods; changes in the characteristics of the corpora lutea in pregnant and nonpregnant ewes, by McKenzie, M. J. Guthrie, and V. Warbritton; and the cell number of fertilized and unfertilized ova found in the tubes and uteri of ewes up to 11 days after the onset of oestrum, by McKenzie and E. Allen.

The biological diagnosis of pregnancy in domestic animals, S. A. ASDELL and L. L. MADSEN (*Cornell Vet., 23 (1933), No. 1, pp. 59–63*).—Various biological tests for diagnosing pregnancy in animals are presented. It is pointed out that the placental sign may be used where the burrowing type of placenta is characteristically found in the animal. The presence of gonad-stimulating substances in the blood or urine prove satisfactory in most animals, but these substances have not been found in cows and goats. The determination of the presence of oestrum in the urine may be used in the cow, but it is not reliable until after 100 days.

FIELD CROPS

The value and application of growth curves to field plat experiments, K. H. W. KLAGES (*Jour. Amer. Soc. Agron., 25 (1933), No. 7, pp. 453–464, figs. 3*).—Two years' growth data on cereals and flax at the South Dakota Experiment Station are presented to show that the construction and analysis of growth curves may provide information of value to supplement yield data from plat experiments, especially insofar as such curves may indicate a basis for evaluating different seasons encountered during the experiment. Fitting the growth data to straight-line trends by the method of least squares furnished the most reliable and workable means of expressing the general slope of growth curves of crop plants. It was shown rather conclusively that the types of curves produced by plants with similar habits of growth, such as spring-sown cereal crops, are more indicative of the seasonal conditions shaping such growth curves, especially those factors determining the slope of these curves, than of the genetic differences of the crops or varieties grown.

The reliability of nursery tests as shown by correlated yields from nursery rows and field plats, K. H. W. KLAGES (*Jour. Amer. Soc. Agron., 25 (1933), No. 7, pp. 464–472, figs. 3*).—Yield data from both regular variety test plats and nursery rows of common spring and durum wheat, oats, barley, and flax, grown for 3 and 4 years at the South Dakota Experiment Station, were compared from viewpoints of degrees of correlation between them and on the basis of rank agreement. Rather significant correlations found between the yields of the regular variety tests and nursery plats showed that very accurate yield data could be obtained by the use of nursery plats.

The determination of the number of samples necessary to measure differences with varying degrees of precision, J. R. LIVERMORE and W. NEELY (*Jour. Amer. Soc. Agron., 25 (1933), No. 9, pp. 573–577*).—The tables included in this contribution from Cornell University enable the experimenter to obtain easily a rough approximation of the number of plats necessary in a proposed experiment.

Field crops for interior Alaska, F. L. HIGGINS (*Alaska Stas. Circ. 4 (1933), pp. 13, figs. 13*).—The history, characteristics, and field performance of varieties of spring wheat, barley, oats, winter rye, field peas, canning peas, vetch, alfalfa, grasses, mangels, rutabagas, turnips, and potatoes found best adapted to local conditions in interior Alaska are discussed briefly.

[Field crops experiments in Kentucky] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 43, 51, 52, 53, 66–68*).—Agronomic research (E.S.R., 68, p. 318) again reported on briefly from the station and the Western Kentucky Substation included rotation and fertilizer experiments with tobacco, breeding work with corn, effects of legumes in the rotation on yields of corn and wheat, variety trials with sorgo for sirup and red clover, pasture experiments, and the residual effects of legumes on the yield of bluegrass.

[Field crops experiments in Missouri], M. F. MILLER, L. M. TURK, H. F. RHOADES, W. C. ETHERIDGE, L. J. STADLER, W. R. TASCHER, S. F. GOODSELL, R. T. KIRKPATRICK, E. M. BROWN, C. A. HELM, and B. M. KING (*Missouri Sta. Bul. 328 (1933), pp. 4, 15–18, fig. 1*).—Agronomic research (E.S.R., 67, p. 378) again reviewed briefly was concerned with the genetic and physiological effects of irradiation of corn; seedling mutations found in progenies of X-rayed corn plants crossed with linkage testers (E.S.R., 67, p. 225); breeding work with corn, wheat, oats, and soybeans; varietal trials with corn, wheat, barley, oats, grain sorghum, sorgo, soybeans, and cotton; fertilizer tests with cotton and pasture; grain sorghum v. corn for hay and grain production; yields of corn, timothy, and wheat under prolonged continuous cropping; and the effect of crop rotation on cotton yields.

[Field crops experiments in Tennessee], C. A. MOOERS, S. H. ESSARY, B. D. DRAIN, H. P. OGDEN, L. R. NEEL, and B. P. HAZLEWOOD (*Tennessee Sta. Rpt. 1932, pp. 8–10, 14–19, 35, 40, 41, 42, 43, 44, 45, 46, fig. 1*).—Experimentation with field crops again reported on from the station and substations (E.S.R., 68, p. 182) included variety tests with cotton, corn, wheat, oats, rye, potatoes, sweetpotatoes, lespedeza, barley, and soybeans; cultural (including planting) experiments with cotton, corn, potatoes, crimson clover, and lespedeza; fertilizer tests with sweet corn, cotton, sweetpotatoes, and Sudan grass; effects of spring drilling soybeans on winter oats and sowing barley on lespedeza sod without plowing; production, fertilizer, and feeding tests with perennial lespedeza (*L. sericea*); harvesting seed of hop clover and bluegrass; the use of a cotton-lint sorter; and pasture experiments. Some of the work was in cooperation with the U.S. Department of Agriculture.

[Agronomic research in Texas], E. B. REYNOLDS, D. T. KILLOUGH, R. E. KARPER, P. C. MANGELSDORF, G. T. MCNESS, P. R. JOHNSON, B. L. WARWICK, R. G. REEVES, H. E. REA, H. P. SMITH, W. R. HORLACHER, E. MORTENSEN, R. A. HALL, R. H. STANSEL, R. H. WYCHE, H. M. BEACHELL, H. DUNLAVY, S. E. WOLFF, P. B. DUNKLE, I. M. ATKINS, R. E. DICKSON, B. C. LANGLEY, D. L. JONES, F. GAINES, J. J. BAYLES, H. F. MORRIS, J. R. QUINBY, J. C. STEPHENS, W. H. FRIEND, J. F. WOOD, and C. H. MCDOWELL (*Texas Sta. Rpt. 1932 pp. 41–51 52–58 109–*

113, 117–120, 123, 124, 130–134, 136–142, 143–146, 151, 155–160, 161, 162, 166–169, 172, 173, 174–176, 180–184, 204, 205, 206, 212–214, 222).—Agronomic and plant breeding experiments (E.S.R., 68, p. 667) continued at the station and substations, and reviewed briefly, included variety tests with cotton, corn, wheat, oats, barley, rice, grain sorghum, sorgo, broomcorn, potatoes, peanuts, soybeans, cowpeas, velvetbeans, alfalfa, lespedeza, and miscellaneous winter and summer legumes and grasses; trials of tobacco; breeding work with cotton, wheat, oats, barley, corn, sweet corn, pop corn, rice, grain sorghum, sorgo, and peanuts; inheritance studies with cotton, corn, rice, and grain sorghum; a study of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum;* natural crossing in rice; effect of radiation on cotton and asexual propagation of cotton; cultural (including planting) trials with cotton, corn, wheat, oats, barley, rice, grain sorghum, sorgo, and winter peas; seed bed preparation studies; comparisons of corn and grain sorghums; effect of grain sorghum varieties and corn on spring oats; residual effects on sorghums of chlorate sprays; irrigation tests with potatoes; effect of continuous submergence on rice seed; seed treatments with cotton and sorghums; fertilizer trials with crops in rotation, corn, wheat, oats, rice, peanuts, cotton, and potatoes; fertilizer experiments in control of cotton root rot; fertilizer placement studies; green manures for various crops; harvesting, storage, and ginning experiments with cotton; weed control tests; lawn grasses; pasture improvement and management investigations; soil fertility studies; and crop rotations. Certain phases of work were in cooperation with the U.S. Department of Agriculture.

Winter cover crop experiments at the Pee Dee Experiment Station, E. E. Hall, W. B. Albert, and S. J. Watson (*South Carolina Sta. Circ. 51* (*1933*), *pp. 13, figs. 8*).—The monantha and hairy vetches outyielded Hungarian vetch and Austrian winter peas in dry matter in top growth and in total nitrogen per acre. Maximum average increases in seed cotton occurred after hairy vetch and monantha vetch. With the exception of that after Austrian peas, cotton receiving no sodium nitrate following cover crops produced a greater average yield than the check areas receiving 200 lb. of sodium nitrate per acre. The least average increases in seed cotton, where the crop received a side dressing of sodium nitrate 200 lb., occurred after hairy and monantha vetches were plowed under.

Indications were that cover crops (as hairy and monantha vetches) over a period of years can largely replace heavy side applications of sodium nitrate without appreciable reductions in cotton yields. For best results these cover crops should be sown early in the fall, preferably late in September, at a rate sufficient to produce a good stand.

Lodging in small grains, E. R. Clark and H. K. Wilson (*Jour. Amer. Soc. Agron., 25* (*1933*), *No. 9, pp. 561–572 fig. 1*).—Study of rates of tillering in 24 varieties of spring and durum wheat and 17 varieties of barley grown in $\frac{1}{40}$ acre varietal plats at the Minnesota Experiment Station in 1931 revealed no differences in tillering rates of wheat plats attributable to genetic differences in varieties, since the variance between the average tillering rates was not statistically significant. However, study of the partial correlation between tilering rates in two replicated series, holding stand constant, indicated that tillering differences were associated with differences in stands. No correlation was found between the tillering rates of wheat varieties in these trials and the lodging behavior of the same sorts at Morris, Minn., in 1930. The significant differences in rates of tillering among the 17 barley varieties were not associated entirely with differences in stand but might be genetic.

The differences in breaking strength among the wheat varieties were found to be significant. The correlation coefficient between breaking strength and diameter of culm was 0.537±0.148. No correlation was found between the breaking strengths and the lodging behavior of the same varieties at Morris in 1930 and at four Minnesota localities in 1928–30. The three durum wheats studied had higher breaking strength, greater diameter of culm, and lower tillering rate than the common wheat varieties.

Inoculation of legumes as related to soil acidity, W. A. ALBRECHT (*Jour. Amer. Soc. Agron., 25 (1933), No. 8, pp. 512–522, figs. 5*).—The effects of different levels of calcium through a wide range of degrees of acidity on the inoculation of soybeans were measured in further experiments (E.S.R., 68, p. 325) at the Missouri Experiment Station. Soybeans were grown on standardized sand-clay media with three levels of calcium provided through a pH range of from 4 to 6.5 by intervals of 0.5 pH.

The degree of soil acidity evidently was responsible as an environmental factor for nodulation failure on excessively sour soils. In these experiments the acidity at which failure occurred was at pH 5 and lower values. With larger pH figures or less acid soils a failure of nodulation was due to deficiency of available calcium in the soil rather than degree of acidity. A decided effect of the element calcium on nodule production of soils with a pH of 5.5 and higher and an increasing nutritional influence of calcium as the soils are less acid were evident. These experiments are thought to separate for the first time the effect on nodulation of H-ion concentration from that of available calcium, and to serve further to indicate the supply of available calcium of the soil as an essential condition for growth and thorough inoculation of soybeans or possibly other legumes. A significance of calcium in symbiotic process was indicated.

Soil and field-crop management for St. Lawrence County, New York.—II, Pasture improvement and management, D. B. JOHNSTONE-WALLACE (*New York Cornell Sta. Bul. 570 (1933), pp. 30–49, figs. 15*).—The types of pastures in St. Lawrence County, N.Y., and their botanical and mineral composition and the chemical composition of their herbage are described, and suggestions are made for their improvement by the application of phosphorus, rotation grazing, harrowing, and re-seeding.

Three years' results with an intensively managed pasture, D. S. FINK, G. B. MORTIMER, and E. TRUOG (*Jour. Amer. Soc. Agron., 25 (1933), No. 7, pp. 441–453, fig. 1*).—Progress is reported from a Wisconsin Experiment Station investigation to determine the adaptability to dairy farms of an intensive system of pasture management involving systematic rotational grazing and annual applications of nitrogen (as calcium cyanamide) and potash, and phosphatic fertilizers when needed. The experiments were made on permanent pasture of river bottom land, largely rather poor Clyde sandy loam. This was divided into variously fertilized paddocks grazed in rotation by milk cows and young stock, the latter following the cows to complete the grazing of each paddock.

During the first year, a completely fertilized area produced about three times as much pasturage as an unfertilized area. Omission of nitrogen after the first year caused a decrease of pasturage of 35 percent the next year and about 50 percent the second year, and caused the production of the unfertilized paddock to revert rapidly to its original low level. The average cost for the 3-year period of producing milk per hundredweight on completely fertilized pasture was 43 c. less than with manger feeding. Benefits of fertilizer treatment were very evident on the turf, which was greatly thickened and improved and largely free from weeds and from injury by the white grub. Under Wisconsin conditions where midsummer droughts are common, supplementary pasture (such as Sudan grass and meadow aftermaths) seemed necessary to fill in when the permanent pasture failed to supply enough grass, which is usually between July 15 and August 1.

Barley improvement conference (*Minneapolis: Natl. Grain Jour., 1933, pp. 23*).—This report of the conference held in Minneapolis, Minn., January 25–26, 1933, includes the following papers: Barley in Northwest Cropping Systems, by H. L. Walster (pp. 4, 5); Commercial Uses of Barley, by R. H. Black (p. 6); Barley Varieties for the Barley Areas, by T. E. Stoa (pp. 8–11); Malting Values, by F. M. Dupont (pp. 11, 12); Why Have Barley Varieties? by L. Powers (p. 13); Quality of Malting as Affected by Soil, Climate, and Harvesting Methods, by B. D. Leith (pp. 14, 15); Barley Diseases as Affecting Yield, and Malting Qualities, by J. G. Dickson (pp. 15, 16); Types of Barley Suitable for Malt Requirements in the United States—the Grades and Characteristics Pertaining to Same, by C. Kurth, Jr. (pp. 16, 17); Illinois Malting Barley, by G. H. Dungan (pp. 17, 18); Relative Economic Position of Barley to Other Crops, by F. W. Peck (pp. 18, 19); Barley Improvement Work of the Past Five Years, by R. E. Johnston (pp. 19, 20); and Summary of Barley Valuation Exhibit, by R. H. Black (pp. 20–22).

Factors affecting experimental error in field plot tests with corn, A. A. Bryan (*Iowa Sta. Res. Bul. 163 (1933), pp. 241–280, figs. 4*).—The variability among the yields of 2,304 hills of each of Krug, Iodent, and McCulloch, commonly grown strains of yellow dent corn, is shown by the data presented. The variability among the mean yields of different numbers of randomly drawn perfect-stand hills decreased in close agreement with expectancy, as the number of hills rose to 192. Since the reduction was rather small after 48 hills were drawn, this number is considered about enough to represent a variety. Equal degrees of precision were attained with about one half as many plants or hills of crosses of inbred lines as of open-pollinated varieties. Plat yields varied less as the size of plat rose from 8 to 16, to 24, and to 48 hills, but the decrease was not proportional to plat size. Therefore, the experimental error for a given area would be lower with larger numbers of smaller plats. Variability among the means of dummy "varieties" decreased as the number of hills devoted to a "variety" rose from 96 to 144 and to 192. The results agreed with those of other investigations in that single-row, i.e., long, narrow plats, had a lower experimental error than plats of the same area but more nearly square. Shape was less important with smaller plats.

The correlation among plats within replications was relatively large only when the number of "varieties" was relatively small. Maximum correlations were obtained in two experiments with 32 single-row plats in a replication, while in a third experiment, about equal correlations were obtained with 24, 32, and 48 single-row plats in a replication. Correlations within 4- and 6-row groups of plats, such as would be used with the moving average method, were markedly higher than the above. Since the variation that can be eliminated by analysis seemed to be restricted to that between replications, analysis of variance will evidently be most efficient when only a few items are being compared. Some of the variation within replications can be eliminated by adjusting to regression on a moving average.

The significance of differences approximating 7.6, 8.9, and 9.9 percent of the mean was determined with eighteen 8-hill, nine 16-hill, and six 24-hill plats, respectively. The tendency was toward the greater efficiency of the smaller plat and toward a reduction in the estimated variance in fairly good agreement with theoretical expectancy as the number of replications was increased.

Corn breeding, G. K. Middleton and P. H. Kime (*North Carolina Sta. Agron. Inform. Circ. 81 (1933), pp. [1]+4, pl. 1*).—Several methods of breeding and selection used in the improvement of the yield of the corn crop are outlined briefly.

Pima Egyptian cotton in irrigated rotations at the Yuma Field Station, Bard, Calif., S. H. Hastings and E. G. Noble (*U.S. Dept. Agr., Tech. Bul. 369 (1933), pp. 31, figs. 3*).—Rotations begun in 1923 to determine the best sequence and the effects of fertilizers, manure, and soil improvement crops on maintenance or improvement of cotton yields are reviewed for the periods 1923–26 and 1927–30. Information is given on the status of crops on the Yuma Reclamation Project, on the soil, climate, and cultural practices, and on the relative merits of Pima Egyptian and upland cottons.

Maximum cotton yields in both periods were from a plat continuously cropped and manured, and the lowest yields were from a 3-year rotation of cotton (sweetclover), grain sorghum, barley (sweetclover), and corn. Alfalfa increased cotton yields in every case over simple rotations omitting this crop, better results being had when the last year of the alfalfa was pastured instead of cut for hay. Inclusion of green manure crops, as vetch, clover, and cowpeas in the rotation, or applications of commercial fertilizer, did not influence cotton yields materially. Relatively close spacing of plants in the row resulted in slightly higher yields of seed cotton per acre than wider spacings. Indications were that on productive land in the lower Colorado River region, Pima cotton may prove more profitable than upland cotton.

The effects of simulated hail injuries on flax, K. H. W. Klages (*Jour. Amer. Soc. Agron., 25 (1933), No. 8, pp. 534–540, figs. 3*).—Flax plants during six stages of development at the South Dakota Experiment Station were subjected to simulated hail damage involving four distinct types of plant injuries, i.e., (1) plants were cut 1 in. above the soil line, (2) plants were whipped with a forked willow switch, (3) the leaves were stripped off, and (4) plants were bent over at the soil line. Besides these distinct injuries, a combination of stripping the leaves and bending the plants over was devised.

Clipping the plants 1 in. above the soil level resulted in very severe reductions in yield. In fact, plants clipped after they were 6 and 9 in. high showed practically no recovery. Flax plants whipped prior to full bloom with a branched willow switch, which produced a good semblance of actual hail damage, showed a fair degree of recovery. The plants recuperated rapidly from a removal of practically all of their leaves during early growth stages. Injuries to leaves produced most evident detrimental effects during the bud and flowering stages. When the plants were bent over, severe reductions in yields occurred in all except the very early phases of development.

Mechanical injuries to the stems of flax plants appeared to lead to materially greater reduction in yield than injuries or even removal of the leaves. The degree of recovery from any type of plant injury seemed to depend largely upon climatic conditions following the injuries.

The relation of moisture to respiration and heating in stored oats, A. L. Bakke and N. L. Noecker (*Iowa Sta. Res. Bul. 165 (1933), pp. 317–336, figs. 9*).—Oats containing more than 15 percent of moisture, held in insulated flasks, heated as the moisture rose to 24 percent, where maximum heating occurred, with a gradual but irregular decline in heating above 24 percent. Heating was negligible below 15 percent. The grain with 40.01 percent of moisture consumed the greatest quantity of oxygen. A general tendency was noted for respiration to increase with the moisture content up to the optimum, although there was considerable variation. High temperatures developing in moist grain during self-heating lowered the vitality of the seed. The dry grain was injured less by high temperatures than moist grain.

Micro-organisms isolated from samples taken from several of the flasks included *Aspergillus niger*, *A. flavus*, *Rhizopus* sp., *Fusarium* sp., *Pencillium* sp., and several species of bacteria. The irregularities in oxygen consumption and temperature probably are due to variation in the fungal flora of different seed lots. This study is held to confirm pure culture work with reference to the influence of fungi in the heating of stored grain.

Irish potato investigations, J. C. MILLER and W. D. KIMBROUGH (*Louisiana Stas. Bul. 239* (*1933*), *pp. 16, fig. 1*).—Fertilizer experiments with potatoes from 1930–32 at the station, Houma, and Alexandria, La., showed the crop to respond in increased yields to nitrogen, phosphorus, and potassium, especially to nitrogen, although the use of a complete fertilizer appeared best. The treatment recommended was 800 lb. of a 4–8–4 or 4–12–4 formula at planting, with 160 lb. of ammonium sulfate as a top-dressing when the plants mark the row. Concentrated fertilizers generally compared favorably with the standard 4–8–4. A 1-oz. set was indicated for general planting and a 1.5-oz. size for very early plantings. Spacing tests suggested a planting distance of 14 in., although 16 in. seemed best on the lighter poorer soils.

A comparison of irrigated and non-irrigated seed potatoes, F. M. HARRINGTON (*Montana Sta. Bul. 279* (*1933*), *pp. 11*).—Comparative trials from 1923 to 1932 with several varieties of potatoes showed irrigated and nonirrigated seed potatoes to be of equal worth in vitality and productiveness. The proportion of high-yielding lots was divided equally between the two kinds of seed. Marked differences between seed stocks were not evident after prolonged periods of culture either under irrigation or nonirrigation. Other station tests indicated that other factors, e.g., storage conditions, affect vigor and vitality more than does irrigation water.

The Katahdin and Chippewa potatoes, C. F. CLARK, W. STUART, and F. J. STEVENSON (*U.S. Dept. Agr. Circ. 276* (*1933*), *pp. 8, figs. 2*).—Katahdin and Chippewa, two new potato varieties resistant to mild mosaic but not to leaf roll or spindle tuber, are described as high-yielding and as producing tubers with excellent shape, shallow eyes, and desirable cooking quality. The origin of each is indicated.

Vines of Katahdin mature late, but under some conditions the tubers set comparatively early. Tests indicated that it may replace the Rural varieties in parts of Michigan and Iowa and in the higher altitudes of Colorado and North Carolina, but probably not in Ohio. It gave excellent results in comparisons with the Burbank varieties in Oregon.

Chippewa resembles Katahdin in many characteristics, although its tubers average slightly longer in relation to their width than those of Katahdin. Since it is considerably earlier than Katahdin and somewhat earlier than Green Mountain, Chippewa probably is better adapted to certain parts of Michigan and Minnesota and other States with similar conditions. At Presque Isle, Maine, it consistently outyielded Katahdin, Irish Cobbler, Green Mountain, and Rural New Yorker No. 2 in total bushels per acre.

Effect of fertilizers on the yield of rice grown in pots, J. W. JONES (*Jour. Amer. Soc. Agron., 25* (*1933*), *No. 8, pp. 548–554*).—In fertilizer experiments made in 1927–29 by the U.S. Department of Agriculture cooperating with the California Experiment Station, fertilizers were applied singly and in combinations to Caloro rice grown in pots at the Biggs Rice Field Station.

All plants grown in fertilized soil, except that receiving potassium nitrate and potassium sulfate, were slightly taller and produced more culms than the checks. However, only the average increase in the height of plants grown in soil fertilized with bur-clover and a complete fertilizer, respectively, seemed to be significant. The increase in number of culms averaged from 1 percent in plants in soil treated with dried blood to 27.8 percent in plants in soil fertilized with bur-clover. Significant increases in grain yields obtained from ammonium sulfate and superphosphate in combination, a complete fertilizer, and bur-clover averaged 11.9, 13.1, and 25.3 percent, respectively. The plants in all treatments, including the check, produced slightly more straw than grain, except those in soil fertilized with potassium nitrate and potassium sulfate. The grain to straw ratios varied from 1:0.94 on soil fertilized with potassium nitrate to 1:1.15 on soil fertilized with cottonseed meal. None of the fertilized plants produced seed significantly heavier than the checks. Application of bur-clover resulted in the largest rice yields, whereas superphosphate, potassium sulfate, and potassium nitrate applied alone did not affect yield appreciably.

Effect of depth of submergence on the control of barnyard grass and the yield of rice grown in pots, J. W. Jones (*Jour. Amer. Soc. Agron., 25 (1933), No. 9, pp. 578–583*).—In studies at the Biggs (Calif.) Rice Field Station made by the U.S. Department of Agriculture cooperating with the California Experiment Station, so-called "white" barnyard grasses with large seeds emerged in each of three years through 2, 4, 6, 8, and 10 in. of water with similar stands, the time required for emergence varying with the depth of water. Deep water delayed emergence and reduced the growth of the grass but did not control it. Stands of common barnyard grasses on land submerged continuously to depths of 2, 4, 6, 8, and 10 in., respectively, decreased with increased depths of submergence from 2 to 6 in., and seedlings did not emerge through 8 to 10 in. of water. Controlling the common barnyard grass by continuous submergence appeared to be the result of the interaction of several factors, particularly higher water temperatures resulting in a low oxygen pressure, and shade from scum, algae, and plant growth. Seedlings in shaded warm water cannot thrive, due to disturbed photosynthetic activity.

The rice plants in soil kept in a mucky condition were shorter and produced fewer culms and much lower grain and straw yields than those on soil submerged from 2 to 10 in. Plants grown in soil submerged 4 in. made the highest average grain yield, while the highest average number of culms and straw yield were obtained on soil submerged 6 in. Rice grown on soil submerged 2 in. averaged fewer culms and lower yields of grain and straw than plants in soil submerged 6, 8, and 10 in., respectively.

Mayaguez 28, 49, and 63—three sugar cane varieties commercially resistant to mosaic, R. L. Davis (*Puerto Rico Sta. Agr. Notes No. 61 (1932), pp. 6*).—Field and plat trials in several localities in Puerto Rico indicated Mayaguez 28, 63, and 42, in order, as most promising of a number of sugarcane seedlings described. Mayaguez 28, 49, and 7 were recommended for either upland or nonirrigated lowland trials, and Mayaguez 28, 3, 42, and 63 for irrigated lowland. Mayaguez 28 appeared to have the widest adaptation, giving satisfactory results both on sandy alluvial lowland and on dry hillsides. It is pointed out that results of one or more ratoon crops should be had before extending any of these seedlings on a large acreage.

Variety trials of Mayaguez sugarcane seedlings in 1933: Mayaguez 28 shows wide adaptability, R. L. Davis (*Puerto Rico Sta. Agr. Notes No. 65 (1933), pp. 7*).—Mayaguez 28 and 63 appeared to be the most promising among Mayaguez seedlings extensively tested to date. Their desirable qualities are described briefly. Mayaguez 3 and 42 were not adapted to nonirrigation culture in droughty areas similar to the San German Valley, and are less resistant to hurricane damage than B.H. 10(12). Mayaguez 7 compared well with P.O.J. 2725 in sugar production in the San German Valley, but was inferior to Mayaguez 63 and 28 elsewhere.

Effects of time of planting and of fertilizer mixtures on the curly-top resistant sugar-beet variety U.S. No. 1 in Idaho, A. W. Skuderna, C. E.

CORMANY, and L. A. HURST (*U.S. Dept. Agr. Circ. 273* (*1933*), *pp. 16, figs. 3*).—Experiments near Castleford, Idaho, showed the U.S. No. 1 curly-top resistant variety of sugar beets (E.S.R., 69, p. 818) to respond favorably to seasonably early planting. Unfertilized plats of this variety planted early significantly produced greater weights of beets and sugar per acre than those sown at intermediate dates or later.

In fertilizer trials according to the triangle system, mixtures containing high percentages of phosphoric acid produced larger yields of beets and of sugar per unit area than mixtures in which nitrogen or potash predominated. The stand decreased sharply when the nitrogen in the mixture exceeded 8 percent. Under the test conditions the trend distinctly favored the lower nitrogen ratio in the fertilizer mixture.

Effect of time, depth, and method of plowing upon yield and eradication of biennial sweet clovers, F. S. WILKINS and E. V. COLLINS (*Iowa Sta. Res. Bul. 162* (*1933*), *pp. 217–240, figs. 3*).—Sweetclover may best be plowed under for corn from about April 25 to May 5, as indicated by the dry matter and nitrogen added to the soil and plants eradicated. The dates of harvest ranked in yield of dry matter for tops and roots were May 3–18, November 1–13, October 1, April 9–13, and September 1. Yields of nitrogen ranked in about the same order. Of the total for tops and roots, the tops contained 68 percent of the dry matter and 73 percent of the nitrogen in September, 51 and 48, respectively, in October, 29 and 18 in November, 24 and 28 in April, and 69 and 74 percent in May. The respective nitrogen contents of tops and roots in September were 3.5 and 2.8 percent, October 3.0 and 3.4 percent, November 2.1 and 3.9, April 5.4 and 4.5, and in May 3.4 and 2.6 percent. White sweetclover was superior to yellow in yield of dry matter in the tops, while yellow was superior to white for roots, but for tops and roots there was little difference. Yellow survived somewhat more than white, but the difference was small.

Plowing September 1 killed nearly all of the sweetclover, but about one half of the dry matter and nitrogen was sacrificed. October and November plowing made costly eradication problems, since about 20 plants per square yard survived. The pulverator plow was less effective than the ordinary plow in exterminating the clover for September, October, November, and April plowings. A depth of plowing recognized as providing good tillage practice was preferred. The draft requirements were in direct proportion to depth of plowing and were about the same for both plows. The draft required increased progressively for September, October, and November plowings, dropped sharply for April, and increased for May over April.

When yellow sweetclover was pastured from August 15 on, the survival was reduced nearly 50 percent. Plants buried by hand survived directly in proportion to length of roots for 1-, 3-, 5-, and 7-in. lengths, and inversely in proportion to depths of burying for 3, 5, and 7 in. Fewer small roots survived than did the large ones. The plants transplanted in normal position averaged eight buds per plant. On the surviving plants, 51 percent of the buds produced shoots. Under field conditions there were approximately two shoots per plant. Large roots had more buds than small ones, but practically the same percentage of buds grew from large roots as from small ones. Following dormancy, buds did not grow at temperatures of 28° and 30° F., although they increased an average of 0.5 cm in length in 32 days at 36°, 1 cm at 40°, and 4 cm at 50°.

Huron timothy, M. W. EVANS (*U.S. Dept. Agr. Leaflet 99* (*1933*), *pp. 5, figs. 2*).—Huron, a timothy variety developed in cooperation with the Ohio Experiment Station, was observed to be about 6 days later and to produce more stems than ordinary timothy, which it outyielded in certain trials. Huron appears to be useful in the Pacific Northwest for hay and farm and range pastures. However, it is not recommended for parts of the Central West where timothy seed is produced extensively for general distribution.

The effect of certain cropping systems on the yield and quality of Havana tobacco, A. B. Beaumont, M. E. Snell, and E. B. Holland (*Massachusetts Sta. Bul. 297 (1933), pp. 28, figs. 3*).—Several cropping systems for tobacco, used or suggested for the Connecticut Valley, were compared during the period 1924–32. Tobacco was grown in continuous culture without a cover crop; with timothy, rye, and redtop as cover crops; in two types of rotation; and with manure. In supplementary tests, timothy, corn, potatoes, and onions were grown in alternate years in comparison with continuous tobacco.

Cover crops as a group resulted in tobacco of both better quality and higher yield than did no cover, although the cover crops differed in effect, and only redtop gave advantage of significant magnitude. Besides agronomic advantages of certain cover crops for tobacco, they help abate dust storms due to wind erosion, and may aid where water erosion is serious. Manure as a supplement to fertilizer for tobacco in continuous culture was beneficial. The yield was slightly lower than that from the redtop cover, yet the quality was much superior.

Results of the rotation experiments were quite unfavorable to tobacco, although usually the other crops apparently were benefited by tobacco in the rotation. Corn and hay, and also potatoes, were benefited by alternation with tobacco, whereas onions did not do well when rotated with tobacco. Tobacco grown in the animal husbandry rotations—tobacco, corn, and timothy or clover—was so poor in yield and quality as to exclude this rotation as impracticable for the section. Results were about equally poor with clover and timothy as the sod-forming crop. Farmers desiring a livestock enterprise in connection with tobacco growing evidently should keep tobacco out of any rotation, including corn, timothy, and clover. An injurious effect on tobacco associated with this animal husbandry rotation was characterized by more or less dwarfed or stunted spindling tobacco with an abnormally dark green color, and abnormal wilting during drought, a condition known as brown root rot. Brown root rot usually is worse in wet than in dry seasons, and may be a contributing cause of the generally low production in the valley in wet years.

The cropping systems studied produced little or no change in soil conditions. Continuous culture of tobacco without a cover crop plowed in caused the greatest increase in acidity, which was only 0.5 per pH unit. The use of cover crops, the rotation, and manure tended to stabilize the reaction of the soil. Only in the cash-crop rotation where limestone was used was the acidity of the soil reduced. The several cropping systems likewise produced hardly perceptible changes in stable or semipermanent organic matter of the soil, except an increase where timothy was used as a cover crop or in rotation.

Symptoms of phosphorus deficiency in Turkish tobacco, P. E. Karraker and C. E. Bortner (*Jour. Amer. Soc. Agron., 25 (1933), No. 8, pp. 556–558, fig. 1*).—The effects of phosphorus deficiency in greenhouse cultures of Turkish tobacco observed in Kentucky Experiment Station studies were somewhat more varied than those described by Johnson (E.S.R., 52, p. 247), McMurtrey (E.S.R., 69, p. 362), and Morgan (E.S.R., 61, p. 622). They comprised an abnormal dark green color with easily noticeable dusky tinge; the lack of bulging between the veins of the leaves; in general, the spindling appearance of the plants due to the small stem and leaf petioles in proportion to size of leaves and, particularly, to height of plants; and the development of spots on the leaves on the lower part of the plant when phosphorus was deficient enough, and even the death of the leaves, the lowest dying first and then progressively up the stalk.

Tobacco fertilizer recommendations for 1934, C. B. WILLIAMS ET AL. (*North Carolina Sta. Agron. Inform. Circ. 84 (1933), pp. [2]+4; also Jour. Amer. Soc. Agron., 25 (1933), No. 10, pp. 705–708*).—Analyses, rates of application, and sources of plant foods are suggested for fertilizers for bright flue-cured and dark (sun-cured and shipping) tobacco and for plant beds on tobacco soils in Virginia, North Carolina, South Carolina, and Georgia. Recommendations dealing with the downy mildew or blue mold disease of tobacco are appended.

Winterhardiness in the first generation of several wheat crosses, C. E. ROSENQUIST (*Jour. Amer. Soc. Agron., 25 (1933), No. 8, pp. 528–533*).—Comparisons of 522 hybrid wheat plants with 1,055 parent plants in respect to winterhardiness were made at the Nebraska Experiment Station in the winter of 1927–28.

Fifteen varieties, some hardy, some intermediate, and some nonhardy, were used in the studies. Eighteen of the 21 crosses were either more hardy than, intermediate, or similar to the hardy parent in performance. Six were intermediate, 12 were as hardy as or exceeded the hardier parent, and 3 of the 21 hybrids were as nonhardy as the less hardy parent. It was evident that winterhardiness may act as a dominant, a recessive, or a partly dominant character, depending upon the genetic composition of the varieties entering into the cross. When the average survival of all hardy parents was compared with the average of the F_1 hybrids, the F_1 was found to be nearly as hardy as the hardier parents. Crosses which exceeded the more hardy parent in degree of winterhardiness may have owed the hardiness of the F_1 to the expression of hybrid vigor in the form of resistance to adverse environmental conditions, since crosses showing hybrid vigor as measured by plant weight were also as a rule more winterhardy than the parents.

Yield and protein content of hard red spring wheat under conditions of high temperature and low moisture, L. R. WALDRON (*Jour. Agr. Res. [U.S.], 47 (1933), No. 3, pp. 129–147*).—A statistical study at the North Dakota Experiment Station dealt with yield and other characters of 25 hard red spring wheat varieties grown in 1932 in randomized rod rows on fertile Fargo clay under conditions of high temperature, low moisture, and light incidence of disease.

Significant total correlation coefficients were found between yield and 11 of 14 characters studied. The largest, 0.742, involved weight of grain per spike, while the outstanding negative correlations with yield were −0.571 for date of heading and −0.556 for protein content. Evidently a lengthened period of photosynthetic activity normally considered desirable for good yields may be more than offset by injurious and seasonal conditions of low moisture and high temperature. The supplanting of the older, longer period wheats by the newer, shorter period varieties in the spring-wheat area seemed to be a practical confirmation of the present findings.

The coefficient of multiple determination for spikes per row and weight of grain per spike with respect to yield, 94.1 percent, accounted for all but 5.9 percent of the variance of yield. The correlation of yield to weight of grain per spike with a constant number of spikes per row reached the maximum value of 0.967. Number of spikes per row and weight of grain per spike as affecting yield seemed to constitute a nearly or quite closed system.

The coefficient of multiple determination of weight of grain per spike with respect to percentage of midkernels, weight per 1,000 kernels, and plumpness, was 80.3 percent. When yield was analyzed into the 3 factors just considered and number of spikes per row, the coefficient of multiple determination with respect to yield was 78.3 percent. Both percentage of midkernels and weight per 1,000 kernels seemed to be relatively important factors influencing yield in this experiment.

Of the 9 coefficients calculated involving protein content, 7 were negative and significant. It appeared that under conditions resembling those in this experiment, high protein content is secured at the expense of other desirable characters, such as yield and weight per bushel.

HORTICULTURE

[Horticulture at the Kentucky Station] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 32, 42, 43, 44–46, 54, 57, 58, 69*).—Summaries are presented of the status of investigations on the effect of boron deficiency on lettuce plants; on the effect of soil moisture variations on the growth of tomato plants; on the nutrient requirements of the tomato as revealed by analysis of certain conducting tissues in the stems and the lower leaves; on the effect of organic matter, sodium carbonate, and alkalies on nonsymbiotic nitrogen fixation, nitrification, and growth of the tomato; on the spacing of tomato plants; on variety tests of vegetables; on the value of cover crops for apples and peaches; on the effect of thinning canes on the growth of the raspberry; on variety tests with the raspberry; and on fertilizer experiments with strawberries.

[Horticulture at the Missouri Station] (*Missouri Sta. Bul. 328 (1933), pp. 35, 36*).—The results of the following investigations are briefly discussed: Factors determining hardiness in the apple and methods of increasing it, by T. J. Talbert, C. G. Vinson, and H. G. Swartwout; the evaluation of apple pollination methods, comparative efficiency of certain apple varieties as pollinizers, and the biochemistry of photoperiodism, all by A. E. Murneek; the relation of nitrogen to potassium in apple nutrition, by Murneek and E. J. Gildehaus; natural v. synthetic nitrate of soda in the nutrition of horticultural plants, by Murneek and J. H. Long; nitrogen applications to grapes, by Swartwout; and walnut, pecan, and filbert investigations, by Talbert and Murneek.

[Horticulture at the Tennessee Station], S. H. Essary, B. D. Drain, H. P. Ogden, and B. P. Hazlewood (*Tennessee Sta. Rpt. 1932, pp. 14, 34, 35, 40, 41, 45, 46*).—Among investigations, the progress of which is briefly discussed, are the breeding of disease resistant tomatoes, the breeding of raspberries and strawberries, and the testing of vegetable varieties, all conducted at Knoxville; the fertilizing of beets and spacing and propagation trials with pyrethrum at the Mericourt Substation; and miscellaneous varietal and cultural tests with fruits, vegetables, and ornamentals at the West Tennessee Substation.

[Horticulture at the Texas Station] (*Texas Sta. Rpt. 1932, pp. 17, 18, 19, 20, 21, 113, 114, 122, 134, 142, 169, 170, 171, 172, 176–179, 184, 200–204, 205, 214–216, 217–221*).—Among studies reported on briefly are adaptability investigations with the Meyer lemon, dates, and other fruits and ornamentals, by S. H. Yarnell, W. H. Friend, E. Mortensen, R. H. Stansel, and R. A. Hall; berry breeding, by Yarnell, H. F. Morris, and P. R. Johnson; pecan rootstock and breeding studies, by G. W. Adriance, F. R. Brison, and Yarnell; cytological studies on *Fragaria* and *Rubus*, by Yarnell; effects of the source of seed and kind of fertilizer on the development of tomato pockets, by Yarnell; varietal and pruning studies with figs at Angleton, by Stansel; citrus and fig trials at Beaumont, by R. H. Wyche; grape and shade tree trials at Lubbock, by D. L. Jones and F. Gaines; varietal tests of grapes, vegetables, and ornamentals at Balmorhea, by J. J. Bayles; cultural, varietal, and breeding studies with the blackberry, cantaloup breeding, peach fertilization and culture, and reforestation and ornamental trials at Nacogdoches, by Morris; tests of trees and shrubs at Chillicothe, by J. R. Quinby and J. C. Stephens; variety, spraying, cultural, rootstock, storage, and maturity studies with citrus, by Friend, J. F. Wood, and W. J. Bach; varietal and fertilizer studies with beets, carrots, cabbage, and tomatoes, by Friend and Wood, and adaptability and propagation tests of dates, by Wood, all at Weslaco; fruit and vegetable trials, fertilizer trials with asparagus, and tests of shade trees and ornamentals at Iowa Park, by L. E. Brooks; varietal and rootstock tests of fruits and ornamentals, by E. Mortensen and varietal, type, cultural, and breeding studies with vegetables by L. R. Hawthorn, both at Winter Haven.

The commercial storage of fruits, vegetables, and florists' stocks, D. H. Rose, R. C. Wright, and T. M. Whiteman (*U.S. Dept. Agr. Circ. 278 (1933), pp. 40*).—Designed to present briefly the essential storage requirements of the more important varieties of fruits, vegetables, flowers, and other perishable horticultural products, this paper is divided into a general discussion of the factors involved in successful storage, and sections by Rose on fruits and nuts, by Wright on vegetables, and by Whiteman on cut flowers, florists' greens, rhizomes, tubers, corms, and bulbs. Although most of the data are compiled from earlier papers by the authors and others, some original information is incorporated.

Planning and planting the home garden, P. Murray (*New York: Orange Judd Pub. Co., 1932, pp. XIV+412, pls. 31, figs. 363*).—A popular handbook containing concise information designed to help the makers of small gardens.

A morphological study of flower and seed development in cabbage, R. C. Thompson (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 4, pp. 215–232, figs. 8*).—Herein are presented the results of a microscopical study conducted by the U.S.D.A. Bureau of Plant Industry upon samples taken from Early Jersey Wakefield cabbage plants grown from seeds sown in the early fall and overwintered as mature seedlings in the field. Flower primodia were first observed during late February and early March. The various flower organs appeared in the order of sepals, stamens, carpels, and petals. The microsporangia were observed to be derived from a single row of hypodermal cells under the epidermis of each lobe of the 4-lobed anther, and the megasporangium from a hypodermal cell of the nucellus. The time elapsing between pollination and fertilization varied, but in most cases apparently required five days. The embryo composed the greater portion of the mature ovules and was surrounded by several layers of tissue derived largely from the two integuments. Most of the nucellus was absorbed by the embryo prior to maturity.

A new method of growing cabbage seed, J. C. Miller (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 341, 342*).—Cabbage produced at the Louisiana Experiment Station from seed sown in late July and August proved a satisfactory source of seed when after harvesting the stumps were transplanted and allowed to develop compact leafy rosettes, from which emerged flower stalks about the middle of March. This method allowed for the taking of records on the identical plants which later produced the seed.

Some factors influencing the reproduction of shallots, J. M. Jenkins, Jr., and J. C. Miller (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 315–317*).—At the Louisiana Experiment Station, shallot bulbs stored for 60 days at 40° F. went to seed in 30 days less time than did the controls and from 12 to 19 days sooner than did bulbs stored at the same temperature for 15 or 30 days. Cold storage had a reducing effect on subsequent growth. In cultural tests there was noted a constant increase in size of plants directly proportional to the size of the bulbs planted. At maturity plants from the two smallest grades averaged from 1.5 to 2 lb. in weight as compared with 3 to 3.5 for the two largest grades. Planting in late fall was much more successful than in January because of the rapid development of seed stalks in the late sowings. Differences were observed between strains and between selected clons.

Effects of temperature on metabolism in tomato, G. T. Nightingale (*Bot. Gaz., 95 (1933), No. 1, pp. 35–58, figs. 2*).—From this study, conducted in part at the University of Chicago and in part at the New Jersey Experiment Stations, in which tomato plants grown in sand cultures in glass chambers where the relative humidity was held at 85 percent but temperatures of 55°, 70°, and 95° F. were utilized, it was found that temperature alone has a profound effect on metabolic activity as well as the type of growth.

Plants at 55° made little growth, and although absorbing nitrates readily in the presence of an external supply assimilated very little of this material. At 55° carbohydrates, particularly starch, accumulated in large quantities, suggesting that the assimilation of carbon dioxide exceeded respiration. Externally the plants were yellowish green with purplish veins and stems.

At 70° nitrates were absorbed readily. Plants in cultures with a complete nutrient solution were moderately high in carbohydrates, contained an abundance of elaborated nitrogen, and were a rich green and vigorous.

At 95° plants with no external nitrogen as well as those with complete nutrient supplies rapidly decreased in carbohydrates, indicating that respiration exceeded carbon dioxide assimilation. Because of carbohydrate utilization in protein synthesis, as well as in respiration, plants with an external nitrate supply lost carbohydrates more rapidly and died earlier than those without supplementary nitrates. Even those plants receiving a complete nutrient were soft, yellowish green, and practically free of anthocyanin pigmentation.

Some effects of lightning on tomato plants, S. Hawkins (*Ind. Acad. Sci. Proc., 48 (1932), pp. 57–59, fig. 1*).—Observations in a tomato field near Homestead, Fla., following a lightning stroke showed not only the killing of the plants near the point of contact but also injury to a lesser degree for some distance away. The terminal buds were so severely injured that new growth was forced from the leaf axils, giving the plants a bushy appearance, and this was accompanied by production of little fruit of inferior quality.

Dependable fruits, C. W. Ellenwood and J. S. Shoemaker (*Ohio Sta. Bul. 528 (1933), pp. 41, figs. 6*).—Along the lines of an earlier publication bearing the same title (E.S.R., 55, p. 139), brief descriptive and behavior notes are given for a large number of apple, pear, peach, cherry, plum, grape, strawberry, raspberry, and other hardy fruit varieties which have been tested in the station orchards. In addition information is presented on the planting of various fruit plants.

Some facts about soil management in a New York orchard, R. C. Collison and J. D. Harlan (*New York State Sta. Bul. 629 (1933) pp. 20*).—Observations over a period of years in an Ontario County apple orchard of mixed varieties which had received consistently good soil management but no commercial fertilizer during its developmental period indicated that sufficient reserves of humus and nitrogen had been built up in the early period to maintain regular and uniform bearing during the first years of fruiting; in fact, the profusion of foliage, good growth, and rather poor fruit color seemed indicative of overfeeding.

In 1927 the following plats were established: (1) Continuance of original system of plowing every 2 years and reseeding to red clover, (2) red clover, (3) alfalfa, (4) grass sod, and (5) sweetclover. None of these systems in the subsequent 5 years decreased the soil reserves to a point of causing reduced yields or growth. Soil nitrates remained unusually abundant in all plats, especially the 2-year clover plat, where it is thought they may have been formed at the expense of organic matter. Although some variation in soil moisture was noted, being somewhat higher in the 2-year clover area, no evidence of moisture deficiency was noted on any of the plats. The somewhat higher temperature of tilled soil may have increased biological activities and hastened organic matter destruction in the 2-year clover area.

In 1931 there was noted a slight decline in vigor of foliage in the grassed plat accompanied by somewhat higher fruit color, indicating that applications of available nitrogen might be needed shortly. In concluding, the authors point out the value of having sufficient nitrogen present in the soil without furnishing an excess at the expense of the soil organic mater or at unnecessary money outlays. Sufficient reserves may be accumulated in orchard soils to support the trees for a considerable period after fruiting begins.

Apple root-stock investigations, H. H. Allan and C. E. Woodhead (*New Zeal. Jour. Agr., 46 (1933), No. 5, pp. 256–259, fig. 1*).—At the Plant Research Station, Palmerston North, New Zealand, several types of Northern Spy rootstocks were assembled and classified as to their types of growth on East Malling stock No. IX. Considerable variability was evident in the Northern Spy stocks. In certain orchards Delicious on Northern Spy roots appeared to have an insecure root hold, and in another orchard Jonathan trees on a seedling stock were larger and more productive than those on Northern Spy.

Dusting versus spraying apple orchards in Ohio, F. H. Ballou and I. P. Lewis (*Ohio Sta. Bul. 527 (1933), pp. 17, figs. 5*).—Carried on in five widely separated orchards located under different environments, this study covering the 7 years from 1926 to 1932 shows that the results of dusting and spraying were remarkably similar. The average costs of the two methods were approximately equal, the somewhat higher cost of the dusting materials being offset by the lesser cost of application. Under comparable conditions 100 lb. of dust gave about the same coverage as 650 to 700 gal. of spray. Actual requirements in dusting and spraying schedules and formulas varied with the season and even within the season at different points in the State. Thorough coverage of apple trees at proper intervals with dusts containing from 75 to 90 percent of superfine sulfur gave practically the same results in scab prevention as did thorough spraying. Copper dust, 20 percent monohydrated copper sulfate and 80 percent hydrated lime, gave effective control of scab and Brooks spot but proved unsafe on varieties easily russeted or burned by copper. A copper dust, 10 percent copper sulfate and 90 percent lime, was effective and less harmful. The combination of refined dry lime-sulfur and superfine sulfur was effective in the early sprays, the prebloom and petal fall, but in the heat of midsummer was likely to cause injury to fruit and foliage and was replaced by superfine sulfur used alone. Extremely dilute Bordeaux mixture and lead arsenate proved an almost ideal summer spray for apples, causing no injury in the hottest weather and favoring a fine finish on the fruit.

Lead and arsenic spray residue removal from apples, F. L. Overley, J. L. St. John, E. L. Overholser, and K. Groves (*Washington Col. Sta. Tech. Bul. 286 (1933), pp. 83, figs. 3*).—Extensive studies with apples harvested from trees in experimental plats at Wenatchee and in commercial orchards at Wenatchee and Yakima indicated that various factors, such as the type of washer, the washing material, spray program, growing conditions, and variety, are involved in the removal of residues. Different results obtained in analyzing different samples of the same fruit suggested the inadvisability of accepting the results of a single determination for either lead or arsenic, especially where the results are close to tolerance. Underneath brushes proved more effective in removing both arsenic and lead than were overhead brushes or underneath rollers. However, when sodium silicate was added at the rate of 80 lb. per 100 gal. of solution at 120° F. and further fortified with sawdust or soap to induce foaming, the lead and arsenic were effectively removed even with roller washers. Overhead brushes in the rinse water added to the attractiveness of the fruit but did not affect materially residue removal.

Where more than one cover spray of lead arsenate was used, wiping of fruit was not consistently effective in reducing lead below the tolerance. In the case of apples sprayed with oil-lead arsenate combinations, hydrochloric acid at the maximum concentration of 1.5 percent at 110° was, when used over roller machines, ineffective in reducing arsenic and lead to the desired degree. The addition of common salt increased slightly the effectiveness of the hydrochloric acid under the foregoing conditions.

From one third to one half the original arsenic and lead and from one half to three fourths of the lead residue after washing was present in the stem and calyx basins. Delayed washing of fruit after harvest prevented the removal of arsenic by hydrochloric acid or sodium hydroxide but had no influence in the case of sodium silicate and trisodium phosphate. Fruits from trees infested with red spiders or other insects or from trees suffering from winter injury, inadequate water, or poor nutrition were increasingly difficult to clean. Wax development, the nature of the cuticle, and even the shape of the apple appeared involved.

Injuries from unfavorable washing conditions were manifested in (1) cracking of the skin, (2) burning of the calyx lobes, and (3) discoloration of areas of the skin. The greater the concentration, the longer the immersion, the higher the temperature, the less complete the rinsing, the greater the hazard of injury. Mixtures of different washing agents were more likely to cause injury than were simple solutions.

Relation of storage temperature to the overseas carriage of some further varieties of New Zealand export apples, L. W. Tiller and E. Chittenden (*New Zeal. Jour. Sci. and Technol., 14 (1933), Nos. 4, pp. 241–251; 5, pp. 288–297; also in [New Zeal. Dept. Sci. and Indus. Res.] Bul. 41 (1933), pp. 241–251, 288–297*).—Studies conducted at the Cawthron Institute in 1930 and 1931 with Cox Orange, Jonathan, Cleopatra, Rome Beauty, Granny Smith, Worcester Pearmain, and Dougherty apples indicated that varieties differ somewhat as to the optimum temperature for storage. Cox Orange, for example, considering the control of internal breakdown, kept best at 38° F. Jonathan also required 38° because of the development of deep scald as well as breakdown at lower temperatures. For the remaining five varieties 35° was satisfactory, considering both keeping quality and the development of satisfactory flavor.

Cox Orange apples grown on a well drained fertile soil kept better and were less susceptible to bitter pit than those grown on a well drained but impoverished soil. Somewhat conflicting results in studies of the effect of time of picking on keeping prevented the deduction of conclusions.

Injury to pears caused by paper liners impregnated with sodium silicate, D. H. Rose and J. M. Lutz (*Jour. Agr. Res. [U.S.], 47 (1933), No. 3, pp. 153–162, figs. 3*).—An injury observed on russeted or partly russeted pears, such as Winter Nelis, Beurre Bosc, and P. Barry, was reproduced by placing pears in contact with corrugated paper liners and the seams of excelsior filled pads containing sodium silicate and by applying weak solutions of commercial sodium silicate and of sodium hydroxide to the fruit. Apparently in commercial packages of pears there is frequently sufficient condensation or other excess moisture to cause some of the alkaline substances in the paper liner put together with sodium silicate to go into solution and produce the injury. The spotting produced by paper liners was largely removed by immersing the fruit for 1 hour in a 1 percent solution of hydrochloric acid.

Report of conference on strawberry investigations, J. J. SKINNER ET AL. (*North Carolina Sta. Agron. Inform. Circ. 83 (1933), pp. [1]+12*).—A joint contribution from the U.S.D.A. Bureaus of Chemistry and Soils, Entomology, and Plant Industry and the station, this report includes information on insect enemies of the strawberry, by W. A. Thomas and L. B. Reed; varieties of strawberries, by G. M. Darrow; fertilizers, by C. B. Williams; chemistry of soils from fields containing thrifty and dying strawberry plants, by R. A. Lineberry; sources of nitrogen and concentrated fertilizers, by Skinner; potash sources, by H. B. Mann; time and method of fertilizer application, by Lineberry; strawberry diseases, by G. A. Meckstroth; effect of age of plant on flower production and yield, by E. B. Morrow; cultural and fertilizer studies, by R. Schmidt; and the effect of fertilizer upon growth, yield, and decay, by Darrow.

Effect of quickly available nitrogen on returns from strawberries on Norfolk sandy loam, R. A. LINEBERRY, J. J. SKINNER, H. B. MANN, and C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ. 82 (1933), pp. [1]+6, pl. 1*).—As reported in this joint contribution from the station and the U.S.D.A. Bureau of Chemistry and Soils, applications of sodium nitrate at the rate of 200 lb. per acre on February 3 not only decreased the total yield of marketable strawberries below that secured with 100 lb., but also delayed maturity and lowered the keeping quality of the fruit. In fact, the best-keeping berries were from the no-nitrate plat. Ammonium sulfate in equivalent quantities of nitrogen had much the same effects as sodium nitrate.

The experiments are believed to show that while spring applications of quickly available nitrogen may result in slight yield increases, the delayed ripening and poor carrying quality of the berries usually results in decreased financial returns. Ammonium sulfate, physiologically acid, had an unfavorable effect on the survival of plants in the soil in question (pH about 5.5). Nitrate of soda, tending to decrease acidity, proved more desirable from the standpoint of survival. Apparently alkaline-reacting nitrogen salts should be used on strawberry soils of pH 6 or lower and acid-reacting forms on soils of pH 6.5 to 7.

Some effects of severity of pruning on growth and production in the Concord grape, A. S. COLBY and L. R. TUCKER (*Illinois Sta. Bul. 393 (1933), pp. 177–206, figs. 8*).—Records taken on grapevines trained to the 4-cane Kniffin system but pruned to the following numbers of nodes, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79, and 80–89, showed but little effect of the severity of the pruning on the total amount of shoot length but a striking influence of pruning on total yield, the latter resulting largely from the actual reduction in the possible number of fruit clusters. The vigor of individual shoots was increased proportionally to the severity of the pruning, but the yields of individual shoots were little affected. Thus severe pruning increased the vigor of the shoot but had little influence on its production. Apparently, except under very unusual conditions during the fruiting season, the yielding capacity of a shoot was largely determined in the bud the preceding year. Severe dormant pruning reduced the number of inflorescences to form in the buds along the shoots growing the following summer. Vines pruned to about 56 to 65 nodes produced profitable yields and also the largest number of flower primordia in the buds of the young shoots of the following year.

A study of bud growth in the date palm, D. W. ALBERT and R. H. HILGEMAN (*Date Grower's Inst. Rpt., 9 (1932), pp. 5, 6*).—The dissection in May 1931 of 9 Rhars palms from 28 to 32 years of age growing in the University of

Arizona garden indicated that bud growth continues throughout the year, and that differentiation probably occurs in early summer sometime before the buds start rapid development. The buds in the upper end of the flowering cycle developed later and were apparently more active and grew more rapidly than the lower buds in the same cycle. Fruit bud growth is believed to be correlated directly with the nutrition of the palm rather than with the total number of leaves produced.

Growth rate of Deglet Noor dates, C. L. Crawford (*Date Grower's Inst. Rpt., 10 (1933), p. 8*).—As recorded at the U.S.D.A. Experiment Date Garden, Indio, Calif., in fortnightly measurements of bunches of Deglet Noor dates pollinated at the same time with a known variety, growth was most rapid in the early stages of development. Elongation of both the date and its seeds proceeded more rapidly than did girth expansion. The size and weight of the dates was greatest at approximately the time the red color of the khalal stage was most vivid.

New investigations on the correlation between root and leaf growth and the water requirements of the date palm, W. T. Swingle (*Date Grower's Inst. Rpt., 8 (1931), pp. 7–9*).—The date palm, the only fruit tree cultivated in the United States belonging to the monocotyledons, is said to have long, thin roots with no secondary growth, which probably die back to the crown when deprived of water. It is deemed likely, therefore, that date palms suffer severely from water deficiency that would not harm other fruit trees. On the other hand overirrigation interfered with the ripening of the crop and possibly resulted in soft offshoots that readily succumbed to disease. It is stated that experiments on the irrigation requirements of dates have been initiated at the U.S.D.A. Experiment Date Garden, Indio, Calif., in the hope of solving some of these problems.

Preliminary report on the use of water by dates, M. M. Winslow (*Date Grower's Inst. Rpt., 10 (1933), p. 16*).—Observations in the Coachella Valley, Calif., in the summer of 1932 showed that most of the effective roots of the date palm lie in the first 6 ft. of soil, and indicated that water penetrating to a depth of more than 6 ft. is of relatively little value to the palm.

Mineral nutrition of the date palm, A. R. C. Haas (*Date Grower's Inst. Rpt., 7 (1930), pp. 19–21*).—Studies by the California Citrus Experiment Station upon the chemical composition of leaf pinnae from vigorous and declining Deglet Noor date palms in the Coachella Valley showed them all to be highly siliceous, with those of the declining trees deficient in nitrogen and potash but containing an excess of calcium as compared with healthy tissues. The pulp of dates from vigorous palms was richer in potash than that of fruits from declining palms. Applications of small quantities of copper sulfate were helpful, but the underlying reasons for this beneficial effect were not established.

Viability of pollen and receptivity of pistillate flowers, D. W. Albert (*Date Grower's Inst. Rpt., 7 (1930), pp. 5–7*).—Date pollen held in small glass vials after preliminary drying for 36 hours was found in these studies at the Arizona Experiment Station to contain some viable grains nearly a year later. The percentage of germination declined rapidly after the first 6 months at ordinary room temperatures, but was maintained fairly well in sealed vials held at 34° F. The holding of pollen is not conceded advisable except in cases where fresh pollen is unavailable. Indications were secured that the stigmas of date flowers retain their receptivity over a period of from 15 to 18 days.

The effect of heat on the germination of date pollen, B. Gerard (*Date Grower's Inst. Rpt., 9 (1932), p. 15*).—At the U.S.D.A. Experiment Date Garden, Indio, Calif., samples of fresh date pollen subjected to temperatures of 140°, 160°, 170°, and 190° F. in a small electric oven showed considerable resistance to heat, but were injured in direct proportion to the degree of temperature and the duration of the exposure. At 190°, 15 minutes sufficed to lower the viability of Fard pollen from 87 percent down to 18 percent. In 60 minutes all pollen was killed.

The commercial utilization of differences in time of ripening of dates due to pollen, R. W. NIXON (*Date Grower's Inst. Rpt., 8 (1931), pp. 5, 6*).—Having reported in an earlier paper on the direct influence of the pollen on the time of ripening of certain dates (E.S.R., 60, p. 542), the author discusses the results of a commercial trial of the earlier findings. Deglet Noor palms at the U.S.D.A. Experiment Date Garden, Indio, Calif., pollinated with Fard pollen ripened 61 percent of their fruits in September, while those pollinated with Mosque matured only 27 percent in the same period. Even more striking results were secured with Deglet Noor in a commercial garden. Here only 9 percent of the Fard-pollinated crop remained on the palms by November 1, whereas Cook No. 1-pollinated palms still carried 55 percent of their fruit at that date. Since fruits maturing after December 1 are apt to be inferior to the October and November crops, the control of the time of ripening is considered highly desirable.

Ripening dates earlier by using different pollen, H. R. WHITTLESEY (*Date Grower's Inst. Rpt., 10 (1933), p. 9*).—Following up the work of Nixon noted above, date palms were pollinated with Fard and Krutz No. 1 pollens and careful records made as to the time of ripening of the fruits. By October 26 those receiving Fard pollen in addition to Krutz had ripened 70 percent of their fruit, as compared with 61 percent for the palms receiving Krutz pollen only. Reversing experimental treatments the following year, even more striking results were secured with Fard pollen.

Notes on rain damage to varieties at the U.S. Experiment Date Garden, R. W. NIXON (*Date Grower's Inst. Rpt., 10 (1933), pp. 13, 14*).—Describing the injury to dates resulting from rains falling during the growing period, the author presents data on the behavior of many different varieties, including Deglet Noor, Halawy, Khadrawy, and others.

Experiments with California dates in storage, W. R. BARGER (*Date Grower's Inst. Rpt., 10 (1933), pp. 3–5*).—At 32° and 70° F. a relative humidity of 65 to 70 percent kept dates at a constant weight, but at 82 percent or above dates absorbed considerable moisture. The spotting of dates due to crystallization of sugar beneath the epidermis was prevented at temperatures of 0° to 10°. Stored dates appeared no more or less perishable after removal from storage than did comparable dates not subjected to low temperature. Rapid cooling of the dates was found necessary for retarding ripening and deterioration. Cured cane sugar type Deglet Noor dates kept well for 6 months at 32° and for a year at 18°. Noncured dates, on the other hand, required 18° for 6 months' and 0° for a year's storage. Moisture-proof wrappers or containers reduce the deterioration due to moisture uptake in storage and moisture loss after storage.

On the flower types of Diospyros kaki L. f., I. NAMIKAWA, M. SISA, and K. ASAI (*Japan. Jour. Bot., 6 (1932), No. 2, pp. 139–172, figs. 23*).—Observations on staminate flowers of four monoecious varieties of Japanese persimmon showed three types of pistillodes differing in their tendency to vary in size. Staminodes could be classified in the following manner: (1) Those in which sporogenous cells were not initiated, (2) those in which the lysigenous cavities were formed, and (3) those in which microsporocytes were formed and meiosis proceeded up to the tetrad stage. The authors conclude that the monoecious forms of the Japanese persimmon are as completely evolved as the dioecious, and that there is a gradient from the bisporangiate to the dioecious condition in this species.

Propagation of tea from etiolated shoots, J. N. Milsum and T. D. Marsh (*Malayan Agr. Jour., 21 (1933), No. 7, pp. 310–313, pl. 1*).—Collar pruning of tea plants resulted in the formation of numerous shoots which upon mounding with soil became etiolated at the base and rooted freely above wire constrictions. Satisfactory asexual reproduction of citrus was secured by laying down and covering young trees, with the result that new shoots from the buried stem became etiolated and rooted freely. Refraining from collecting tea leaves for some time prior to pruning stimulated the accumulation of starch and encouraged better rooting.

The storage and seasoning of pecan bud wood, F. R. Brison (*Texas Sta. Bul. 478 (1933), pp. 26, figs. 5*).—Asserting that the patch bud is the principal means employed in the asexual propagation of the pecan and that in commercial practice both current and preceding season's wood are used, the author describes a practice in which bud wood cut late in the dormant period is held in storage at 32° to 38° F. until needed. Such wood requires seasoning upon removal from storage, and experiments in which bud sticks were held in sphagnum moss moistened to different degrees indicated that the amount of moisture may vary widely without retarding the seasoning process. However, when bud sticks were submerged wholly or in part those portions under water failed to season. Of three temperature ranges, 63° to 68°, 78° to 85°, and 93° to 98°, tested for seasoning Stuart wood cut in February and held in cold storage until May, the medium range was alone fully effective. Bud wood cut late in the dormant period seasoned more rapidly than that cut early. That varieties differed is indicated in the fact that under comparable conditions Delmas wood seasoned more readily than Stuart.

In wood overseasoned in the dark the buds expanded, water vessels differentiated and lignified, and starch disappeared. Where the bark of overseasoned shoots separated from the wood the line of cleavage was next to the xylem and not along the cambium layer. Cambial activity resulting in the formation of water vessels was initiated in the base of the bud stick.

The bay oil industry of the Virgin Islands (*Virgin Islands Sta. Agr. News Notes No. 72 (1933), pp. 2*).—A brief general discussion dealing with botany, methods of production, distillation, etc.

Rubber content of various species of goldenrod, L. G. Polhamus (*Jour. Agr. Res. [U.S.], 47 (1933), No. 3, pp. 149–152*).—Analyses of the leaves of 24 species of goldenrod collected in several localities revealed a wide variation in the percentage content of rubber, reaching a maximum of 6.34 percent in *Solidago altissima* and a minimum of 0.56 in *S. squarrosa.* A wide variation observed between plants of a single species, due either to individual plant variation, habitat, or seasonal influence, suggested the possibility of strain selection and also the development of cultural practices promoting rubber content. In 12 leaf samples of *S. altissima* the maximum, minimum, and average rubber contents were 6.34, 1.38, and 3.45, respectively. In no species was there found a significant percentage of rubber in stems or roots; hence species with very small leaves are considered unpromising, even if the percentage content of rubber is relatively high.

Percentage of nonrubber substances, consisting primarily of resins that could be extracted with acetone, was relatively high, reaching 26.45 percent in a leaf sample of *S. minor.* A correlation of 0.397±0.07 was determined between rubber and resin percentage contents in 68 leaf samples of *Solidago.*

FORESTRY

Our forests: What they are and what they mean to us, M. F. Heisley (*U.S. Dept. Agr., Misc. Pub. 162 (1933), pp. 34, figs. 19*).—A general discussion is presented on the physiology of tree growth, tree associations, forest soils, forest regions of the United States, products of the forest, fire and other enemies of the forest, public forestry activities, and commercial forestry.

[Forestry at the Vermont Station] (*Vermont Sta. Bul. 360 (1933), p. 26*).—A brief summary is presented of studies on the photosynthetic activity under controlled laboratory conditions of young white pine and Norway spruce trees; upon the causes of uneven growth in trees; and on the effect of soil temperatures on root growth of seedling forest trees.

Selective logging in the shortleaf and loblolly pine forests of the Gulf States region, R. D. GARVER and R. H. MILLER (*U.S. Dept. Agr., Tech. Bul. 375 (1933), pp. 54, figs. 7*).—Studies at four typical large band-mill lumbering operations located in (1) southern Arkansas, (2) northern Louisiana, (3) eastern Texas, and (4) west-central Arkansas upon the comparative costs, time requirements, net returns, and silvicultural aspects of clear cutting v. selective cutting operations indicated the superiority of the latter, both from the viewpoint of perpetuating the forest and from economic considerations. Production costs were lower for large trees, and in addition, because of the higher grades and greater widths, lumber from large trees was more valuable. It was found approximately twice as costly to produce a unit quantity of lumber from shortleaf and loblolly pine trees 8 in. in diameter as from trees 24 in. in diameter, with lumber from the smaller trees only about three fourths as valuable per unit. Various factors, such as adequate stocking, proper mixture of pines and hardwoods, and removal of the lower limbs, are said to be concerned in the production of good quality lumber. Size for size, older trees in general contained higher quality lumber than did young trees. Among other points in favor of selective logging are the reduction in fire hazard as compared with clean cutting, sustained production, and the decrease in the percentage of logs from unprofitable, nonthrifty trees.

The carbohydrate contents of the maple tree, C. H. JONES and J. L. BRADLEE (*Vermont Sta. Bul. 358 (1933), pp. 147, figs. 42*).—Continuing a long series relating to the maple tree and its products (E.S.R., 61, p. 85), this paper discusses certain of the chemical and physiological changes in the maple tree throughout the entire year. A total of 34 second-growth trees of uniform size and grown under similar conditions were felled at approximately monthly intervals, and samples were taken of different sections and of different tissues. Not only were striking changes in composition observed during the growing season, but also throughout the winter when in the outer wood there was recorded a 22 percent increase in water and 123 percent increase in water-soluble constituents. In this period sucrose and hexoses increased 89 and 721 percent, respectively, while starch and hemicelluloses declined 30 and 8.7 percent. Since the starch decrement was apparently not sufficient to account for the entire increase in hexoses from September to January, the authors believe that more or less sucrose must have inverted. Hemicelluloses, pentosans, and intermediate products are thought to account for much of the sucrose increase which occurred after October, the decrease in hemicelluloses amply accounting for the gain in sucrose and hexoses.

There was noted a gradual increase in concentration of the living cell contents form the base to the top of the tree, a situation apparently operating to protect the living cells in the younger portion of the tree from the damage incident to freezing and thawing. In addition in the younger wood there was more inner bark in relation to the total wood structure.

Summing up, sucrose is deemed to be the circulatory carbohydrate, whereas hexoses were confined to the medullary rays with only very small amounts present in the sap outside these living cells. Hemicelluloses constituted upon the average 24 percent of the total dry matter of the trees. A relatively high concentration of sucrose and hexoses with a low starch content characterized the dormant winter period and the reverse the growing period. The maple tree is compared to a giant sponge, capable of absorbing, holding, and finally exuding water as a result of internal pressure, probably developed by high osmotic concentration within the ray cells.

Composition of forest leaves (*Kentucky Sta. Rpt. 1932, pt. 1, p. 32*).—The results of the analyses of 63 samples of leaves collected from 21 species of forest trees are briefly discussed.

DISEASES OF PLANTS

[Plant disease studies] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 38–42, 52, 53, 54, 55*).—Progress reports are given of investigations of tobacco mosaic, blackroot resistant strains of tobacco, angular leaf spot of tobacco, crown rot of red clover caused by *Sclerotinia trifoliorum*, black stem of red clover and alfalfa caused by a species of *Phoma* and of sweetclover caused by *Mycosphaerella lethalis*, southern anthracnose and a virus disease of red clover, russeting of apples, and apple scab.

[Plant disease studies in Missouri] (*Missouri Sta. Bul. 328 (1933), pp. 25, 26, 35*).—Data are briefly reported on the control of smuts of small grains, cowpea and tobacco mosaic viruses, the genus *Phytophthora*, control of damping-off, a flag-smut survey, and identification of various diseases, all by C. M. Tucker; and preparation of virus from the juice of diseased plants, by C. G. Vinson.

[Plant disease investigations in Tennessee] (*Tennessee Sta. Rpt. 1932, pp. 10–13, 19, 24, 34, 35–39*).—Notes are given on investigations by S. H. Essary on resistance to wilt in red clover and to *Fusarium* wilt in tomatoes (pp. 10–13); by H. P. Ogden on resistance to *Fusarium* wilt and *Ascochyta* blight in peas (p. 19); by W. H. MacIntire on a pulverulent copper-fluorine compound spray (p. 24); by B. D. Drain on a root-knot nematode (p. 34); and by C. D. Sherbakoff on wheat scab and root rot, blossom blight of apples, spraying with flotation sulfur and other fungicides, control of cherry leaf spot, and *Cercospora nicotianae* as the cause of tobacco leaf spot (pp. 35–39).

[Plant disease studies in Texas] (*Texas Sta. Rpt. 1932, pp. 58–79, 146–151, 208–210, 216*).—Results are noted of studies on cotton root rot, by J. J. Taubenhaus, W. N. Ezekiel, S. E. Wolff, C. H. Rogers, L. D. Christensen, J. F. Fudge, and W. J. Bach (pp. 58–71); tomato puffing and a rot due to *Phytophthora parasitica*, by Taubenhaus and Ezekiel (pp. 71, 72); spinach yellows (pp. 72, 73), effect of sulfur compounds on cantaloups (p. 73), resistance to and seed transmission of watermelon wilt (pp. 73, 74), and gray rot and charcoal rot of cantaloups (pp. 74, 75), all by Taubenhaus and Ezekiel; peach mosaic, by Taubenhaus, Ezekiel, and H. B. Parker (p. 75); stem-end rot of citrus (pp. 75, 76), a disease of live oak (p. 76), black knot of plum (p. 76), a new leaf spot of grapes caused by *Briosa ampelophaga* (pp. 76, 77), seed transmission of peanut diseases (p. 77), a disease of young milo, cowpeas, and ragweed due to *Sclerotium bataticola* (p. 77), a root rot and stem blight of Texas bluebells (p. 77), a rust disease of hollyhocks due to *Puccinia heterospora* (p. 78), an anthracnose of *Nandina domestica* (p. 78), and *Aspergillus alliaceus* as a cause of decay of cacti and other plants (p. 78), all by Taubenhaus and Ezekiel; a stem blight of *Cassia artemisioides*, by Taubenhaus and Parks (p. 78); cotton root rot investigations at Temple, in cooperation with the U.S.D.A. Bureaus of Chemistry and Soils and Plant Industry, by Wolff, Rogers, H. E. Rea, and H.

Dunlavy (pp. 146–151); and cotton root rot studies at Weslaco, by Bach (pp. 208–210), and at Iowa Park, by L. E. Brooks and Taubenhaus (p. 216).

The present status of plant virus research, K. M. Smith (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 8 (1933), No. 2, pp. 136–179, pl. 1*).—This is a review of present knowledge on methods of approach to the plant virus problem—properties and nature of plant viruses, symptomatology of virus-affected plants, methods of virus transmission, attempts at cultivation, movements of virus within the plant, metabolism of virus-affected plants, photography of viruses by ultraviolet light, and recovery, "carrying" power, resistance, and immunity relations in affected plants—and on the differentiation of plant viruses. The potato mosaic group is especially considered.

An extensive bibliography of the literature on plant virus diseases is appended.

Virus disease investigations, G. C. Ainsworth (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 18 (1932), pp. 39–45*).—"Stripe" disease of tomatoes may be due to a bacterium (stripe), a single virus (glasshouse streak), or a mixed virus (streak). Properties of the viruses implicated are described. Tomato mosaic was identified with true tobacco mosaic and shown not to be involved in most of the stripe disease of Great Britain. A comparison of the above viruses with spotted wilt is made.

Biological specialization in Phytophthora infestans, D. Reddick and W. Crosier (*Amer. Potato Jour., 10 (1933), No. 7, pp. 129–134*).—From studies at Cornell University the authors find that *P. infestans* as it occurs in most parts of North America either is not biologically specialized or else the varieties of potatoes and tomatoes now grown are not kinds that reveal the presence of more than one form. The form prevalent in North America is the same as the one which occurred at Moskva (Moscow) in 1928 and at München (Munich) in 1930. The demonstration of a biotype in Pommern (Pomerania) in 1932 may be attributed to a new form arising from the production of viable oospores of the fungus, or to the fact that a hybrid possessing *Solanum demissum* "blood" serves to bring out the existence of such a type.

The rate of fall of spores in relation to the epidemiology of black stem rust, H. G. Ukkelberg (*Bul. Torrey Bot. Club, 60 (1933), No. 3, pp. 211–228, figs. 4*).—In studies by the Minnesota Experiment Station and the U.S. Department of Agriculture, the rate of fall in still air of urediniospores of *Puccinia graminis tritici* was found to be 11.57 mm per second, for *P. graminis secalis* 10.58, for *P. coronata avenae* 10, and for *P. triticina* 12.62 mm per second. The rate of fall of aeciospores of *P. graminis tritici* and *P. graminis secalis* in still air was 10.56 and 10.2 mm per second, respectively. The observed difference in the rate of fall of the urediniospores of the four cereal rusts and the aeciospores of the two varieties of rust was found to be statistically significant.

The average theoretical dispersal distance of urediniospores that have reached an altitude of 5,000 ft., and which are being carried by a 30-mile wind, ranged from 1,000 miles for *P. triticina*, 1,270 miles for *P. coronata*, 1,100 miles for *P. graminis tritici*, and 1,200 miles for *P. graminis secalis*. The dispersal distance of aeciospores is greater than that of urediniospores.—(*Courtesy Biol. Abs.*)

Studies on physiologic specialization in Tilletia tritici and T. levis in the Pacific Northwest, H. H. Flor (*Jour. Agr. Res. [U.S.], 47 (1933), No. 4, pp. 193–213, figs. 6*).—Studies of collections of bunt obtained from 182 wheat fields in Oregon, Washington, and northern Idaho, made in cooperation with the experiment stations in those States, showed that 40 percent of the collections contained *T. tritici* alone and 60 percent contained both this species and *T. levis*. The latter species was most abundant west of the Cascade Mountains, but was present in all major wheat-growing regions. Pathogenicity tests with 9 wheat varieties as differential hosts showed the presence of at least 7 forms of *T. tritici* and 6 forms of *T. levis*. Eighty-four percent of the collections contained only the less virulent forms that could not produce bunt in such resistant varieties as Ridit, Albit, Hussar, and White Odessa. However, virulent forms were found in collections obtained from both resistant and susceptible varieties in widely scattered localities. No definite correlation was observed between pathogenicity and such characteristics as size and color of the chlamydospore, reticulation of the spore wall, consistency of the bunt ball, temperature during period of infection, and growth in culture, except that nonchromogenic cultures of *T. levis* invariably belonged to the less virulent pathogenic form not attacking Albit, Hussar, or White Odessa.

Parallel occurrence of Tilletia infection and speltoid characters in Triticum vulgare [trans. title], E. Nilsson (*Hereditas, 18 (1933), No. 1-2, pp. 262-268, figs. 3*).—In a head of the winter wheat variety Standard attacked with smut there was found a single sound grain, from which came a plant with sound grains. The offspring of this plant contained some speltoid types, and some mosaics. There proved to be a strong correlation between speltoid character and smut attack, the normal types being sound and the speltoids diseased. The experiments did not make clear the nature of this correlation, but several possible explanations are suggested.—(*Courtesy Biol. Abs.*)

Black-stem of alfalfa, red clover, and sweet clover, E. M. Johnson and W. D. Valleau (*Kentucky Sta. Bul. 339 (1933), pp. 55-82, figs. 8*).—Blackstems of alfalfa, red clover, and sweetclover are diseases of economic importance in Kentucky, and probably in other humid areas where the winters are mild and the spring season is long and likely to be wet. Spring-sown stands of unadapted red clovers may be destroyed completely when about a year old, the injury apparently being cumulative from the previous year. In seasons favoring the development of the disease, alfalfa stands are greatly reduced and sometimes destroyed. The injury to sweetclover also is sometimes extensive. The maximum injury to each of these crop plants is caused soon after spring growth commences. Leaves are killed by leaf spot, and the tender shoots die either from this cause or direct infection. Blackening of stems, evident late in the spring and the most readily observed symptom, causes comparatively little injury. Blackening of stems of alfalfa and red clover will also develop during the summer if the crops stand beyond the time of cutting for hay.

Blackstem of alfalfa is caused by a *Phoma* sp., apparently identical with *P. medicaginis* and probably with *Phyllostieta medicaginis*. Blackstem of red clover is caused by an apparently newly described species for which the name *Phoma trifolii* n.sp. is suggested. Blackstem of sweetclover is caused by what appears to be *Mycosphaerella lethalis*. Red clover, long grown continuously in Kentucky or from other Southern States, appears to be injured little by *P. trifolii*. Northwestern clovers are sometimes injured considerably, and European varieties seem very susceptible. Alfalfa varieties appear to show distinct differences in degree of injury by *P. medicaginis*, and individual sweetclover plants show marked differences in degree of injury by *M. lethalis*. The *Phomas* on red clover and alfalfa are active during warm periods in winter, causing leaf and petiole spots, and also overwinter in dead stems of the respective crops. Pycnidia are produced in February and March. *M. lethalis* overwinters in dead sweetclover stems where pycnidia and perithecia are produced in early spring. Pycnidia of each of the organisms are produced on spotted leaves placed in a damp chamber and also on recently killed tender shoots.

The loss from blackstem of red clover can be prevented by planting adapted varieties. Since injury to alfalfa stands appears greatest where the last crop of alfalfa is allowed to stand in the fall, destruction of this material by winter grazing or otherwise offers promise of reducing losses of stand during the spring.

A study of the pathological anatomy of the cotton plant in connection with the wilt disease, K. Dharmarajulu (*Indian Jour. Agr. Sci., 2 (1932), No. 3, pp. 293–313, pls. 2, figs. 21*).—*Fusarium vasinfectum* enters the susceptible host with the least resistance, travels through the epidermis, cortex, endodermis, and pericycle without affecting them visibly, and reaches the xylem vessels, which it inhabits thereafter. The mode of entry of the parasite and the manner of its progress are the same in all varieties of cotton—susceptible, resistant, and immune—irrespective of their capacity to resist. In a susceptible type the fungus made its way into the epidermis on the fourth day and reached the xylem on the eighth. At ordinary greenhouse temperature the resistant and immune types were seen to develop peripheral cork over the infected portion and later over the other parts of the root as the fungus encircled it. At a temperature of 25° C., or lower, susceptibility increases, while at high temperature resistance increases. Infected roots develop secondary thickenings much earlier than the controls. The peripheral cork is thick in the infected roots of all varieties, epidermal and cortical cells near the place of infection become suberized and the cell content disorganized, while the controls show only slight suberization of the epidermal cells.

Resistance in cotton seems to be due to the nature of the host protoplasm.—(*Courtesy Biol. Abs.*)

The control of cucumber mildew, O. B. Orchard (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 18 (1932), p. 48*).—A test in 1931 gave reasonable control of *Erysiphe cichoracearum* by spraying with Shirlan and Agral 1. It is deemed essential to spray at intervals of from 3 to 4 days during the first month of attack, following with weekly applications.

Symptoms of fertilizer injury to potatoes, J. Bushnell (*Jour. Amer. Soc. Agron., 25 (1933), No. 6, pp. 397–407, figs. 5*).—In studies at the Ohio Experiment Station, mixed fertilizer in contact with seed potatoes in the soil prevented normal healing of cut surfaces and killed some or all of the tissue inward form the cut surfaces. Under drought conditions sprouts were injured if they encountered fertilizer placed above the seed, but with ample rainfall this type of injury did not appear. The presence of readily soluble fertilizer in close proximity to the seed in all cases retarded the growth of sprouts. All types of injury described are considered to be osmotic effects.

New developments in potato spraying, F. M. Blodgett, E. O. Mader, O. D. Burke, and R. B. McCormack (*Amer. Potato Jour., 10 (1933), No. 5, pp. 79–88, figs. 3*).—Rural potatoes made maximum yields in spraying experiments in upper New York during four years when sprayed at 400 lb. pressure with a seasonal total of from 75 to 80 lb. of copper sulfate as Bordeaux mixture per acre. A ratio of 5 lb. of copper sulfate to 2.5 lb. of hydrated lime to 50 gal. of water appeared to be a safe recommendation. The total quantity of copper applied seemed to be an important factor in success in potato spraying whether effected by concentration of mixture, gallons per acre applied, number of applications, or number of nozzles per row. The optimum quantities vary for different varieties of potatoes or different conditions. The sprayers used caused a measurable loss in yield.

Biochemical study on the infection of potatoes by Synchytrium endobioticum [trans. title], S. Szymański (*Prace Wydz. Chorób Roślin Państ. Inst. Nauk. Gosp. Wiejsk. Bydgoszczy, No. 13 (1933), pp. 141–162; Fr. abs., p. 160*).—

The author determined the differences in chemical composition of healthy potatoes, those infected by *S. endobioticum*, and of the tumors. The tumors contained in the dry matter higher quantities of Fe, Mn, Cu, and N, and it is supposed that these are the elements which cause the growth acceleration of the tumors on the infected tubers.

The compound nature of crinkle and its production by means of a mixture of viruses, P. A. Murphy and R. M'Kay (*Roy. Dublin Soc. Sci. Proc., n. ser., 20 (1932), No. 20, pp. 227–247, pls. 3*).—An experiment conducted by the authors and repeated three times at different periods, in which simple mosaic was introduced into the Irish Chieftain potato carrying another virus, designated A, resulted in a disease that was indistinguishable from crinkle and which persisted as such.

Insect transmission of virus A of potatoes, J. B. Loughnane (*Nature [London], 131 (1933), No. 3319, pp. 838, 839*).—The green peach aphid is said to be an efficient vector of virus A, as designated by Murphy and McKay (see above), from potato to potato and tobacco, and so far as crinkle is concerned it transmits it selectively to the exclusion of the simple mosaic element. There is said to be some evidence to show that *Myzus circumflexum* Buckt. may also act as a vector of virus A.

The virus diseases of potatoes in Poland, 1928–32 [trans. title], L. Garbowski (*Prace Wydz. Chorób Roślin Państ. Inst. Nauk. Gosp. Wiejsk. Bydgoszczy, No. 13 (1933), pp. 3–136, pls. 24; Fr. abs., p. 129*).—After a review of recent investigations (92 titles being listed in the bibliography) of virus diseases of potatoes, the author presents his own observations on the sanitary condition of 110 varieties—principally those destined for field culture in Poland. Of these, 46 varieties were of Polish origin, 49 of German, and the others of English or Dutch origin. Certain of these varieties were characterized by resistance to virus diseases under the conditions of field testing at Bydgoszcz. The degeneration in yield occasioned by progressive degeneration due to the different viruses is shown in a series of tables. Several illustrations serve to distinguish special forms of the virus diseases and also certain spots on the leaves attributable to the influence of physiological conditions.

The author calls attention to the first appearance in Poland of aucuba mosaic and also to several cases of "streak."

Verticillium-wilt of potatoes and tomatoes in New Zealand, E. E. Chamberlain and R. M. Brien (*New Zeal. Jour. Sci. and Technol., 14 (1933), No. 6, pp. 366–371, figs. 4*).—A disease due to *Verticillium* causes considerable losses in potato and tomato crops in New Zealand. The symptoms are wilting and premature death. The same fungus is the cause of the disease on both hosts. From a study of the morphology and the current literature, the organism is considered to be *V. alboatrum.*

Control of stem rot of rice by burning stubble, E. C. Tullis, J. B. Woods, and D. G. Carter (*Agr. Engin., 14 (1933), No. 8, pp. 218, 219*).—In the experiments reported from the Arkansas Experiment Station, working in cooperation with the U.S. Department of Agriculture, burning stubble and straw on the surface of the soil did not completely destroy all the sclerotia of the rice stem rot fungus (*Sclerotium oryzae*) in the soil. Investigations have shown that the fungus produces conidial and ascigerous stages which also may produce infection, and that conidia may be produced in abundance from the relatively few sclerotia not killed by the burning. Burning the straw and stubble on fields kills numerous sclerotia, however, and therefore appears to be a desirable practice for control of stem rot when used in conjunction with other recommended measures.

Leaf-wrinkle, a nutritional disorder of soy bean, E. W. Hopkins (*Plant Physiol., 8 (1933), No. 2, pp. 333–336, fig. 1*).—An injury to soybeans involving the leaf tips of young leaves, which later become much wrinkled on expansion, is described and illustrated. The injury is produced by the nutrient solution and is most severe in low N, high K, low Ca solutions. The relation of Ca, Mg, K, and N seems to be concerned in producing the injury.—(*Courtesy Biol. Abs.*)

Immunological studies of mosaic diseases, II, III, T. Matsumoto and K. Somazawa (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 4 (1932), No. 2, pp. 161–168; Japan. abs., pp. 167, 168; 5 (1933), No. 1, pp. 37–43, figs. 2*).—These papers continue previous work (E.S.R., 68, p. 208).

II. *Distribution of antigenic substance of tobacco mosaic in different parts of host plants.*—The presence of the antigenic substance was demonstrated wherever the infective agent was found, viz, roots, stems, leaves, buds, etc. Apparently formation and distribution of the antigenic substance may take place somewhat earlier at the top than in the subterranean part of the inoculated plants, mostly within 4 or 5 days after inoculation, although the mosaic symptom appears still later. It is suggested that this production may be due to the infective agent and not to any altered host proteins. This serological test may be applicable for the demonstration of the distribution of the virus agent through the tissue.

III. *Further studies on the distribution of antigenic substance of tobacco mosaic in different parts of host plants.*—The authors conclude that they have demonstrated the presence of the antigenic substance, probably the infective principle itself, in the xylem portion of infected tobacco plants. The virus principle is capable of entering the xylem even through an unbroken wall, probably through pits, and it is suggested that tobacco mosaic virus may normally move freely in the xylem as in other living tissues, regardless of the presence or absence of mechanical wounds in the cell walls. This movement, however, may be inhibited when the xylem portion of the "ringed" region is not accompanied by the living cells of the central tissue.—(*Courtesy Biol. Abs.*)

Three bacterial spots of tomato fruit, M. K. Bryan (*U.S. Dept. Agr. Circ. 282 (1933), pp. 2, pls. 4*).—As a supplement for illustrations, descriptions are presented of three fruit spots, bacterial canker (*Aplanobacter michiganense*), bacterial spot (*Bacterium vesicatorium*), and speck (*B. punctilans*). In addition a spot of unknown cause, designated as "ghost spot", is described.

The control of tomato bacterial canker (Aplanobacter michiganense E.F.S.) by fruit-pulp fermentation in the seed-extraction process, H. L. Blood (*Utah Acad. Sci. Proc., 10 (1933), pp. 19–23*).—From these studies, carried on by the Utah Experiment Station in cooperation with the U.S.D.A. Bureau of Plant Industry, it is concluded that sufficient preliminary results have been obtained to justify recommending to all seed growers fruit-pulp fermentation prior to seed extraction, following a reasonable amount of care in seed selection, as a seed treatment for control of this disease. The fruit may be placed in a suitable container and crushed or pulped with an electrically driven rotary knife or mixer and left to ferment with all of the fruit pulp and juices present, but without the addition of water. When large quantities of seed are to be extracted, standard pulping or grinding machines may be employed and the material run into vats and allowed to ferment. Fermentation should proceed for from 3 to 6 days at a temperature of approximately 20° C. (68° F.) or below. All implements or vessels employed in the handling of the seed after it has been washed from the fermentation vats should be cleaned and thoroughly disinfected before use.

Physiological investigations of mosaic disease, B. D. Bolas (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 17 (1931), pp. 47, 48*).—Indications were obtained that the progress of both ordinary and aucuba mosaic in the tomato plant is in many cases connected with carbohydrate metabolism. By artificially increasing the light intensity and temperature and obtaining a high starch concentration in the leaves, typical summer symptoms could be obtained in the winter. However, when the starch concentration was increased by absorption of cane sugar solution in cut ends of infected plants, no typical summer symptoms resulted. "The starch so produced may have differed considerably from the starch produced in the leaf by the action of light." No difference was obtained by inoculating leaves having abundant starch and leaves free from starch provided both were kept in the same environment after inoculation.

Some evidence was obtained that the tomato virus in the living tissues may be inactivated and destroyed by the passage of a direct electric current of 5.0 microamperes per square centimeter of tissue. Apparently the current may be so adjusted as to be nonlethal to the tissues.

Distillation of infected sap in vacuo at room temperature confirmed the view that the infective agent is nonvolatile.

No evidence has been obtained that the infective agent is capable of passing through a well-made parchment paper dialyzer.

None of the results obtained were inconsistent with the view that the infective agent is enzymic or bacterial in nature.—(*Courtesy Biol. Abs.*)

Spotted wilt: An important virus disease of the tomato, K. M. Smith (*Jour. Min. Agr.* [*Gt. Brit.*], *39* (*1933*), *No. 12, pp. 1097–1103, pls. 3*).—The symptoms, methods of spread, host range, and economic importance of spotted wilt are discussed, and preventive and remedial measures suggested.

Some fundamental considerations regarding successful control of apple scab, M. H. Moore (*Fruit-Grower* [*London*], *73* (*1932*), *No. 1895, pp. 591–593, figs. 5; also in East Malling* [*Kent*] *Res. Sta. Ann. Rpt., 19* (*1931*), *pp. 73–77, pls. 2, fig. 1*).—This brief review of some of the more important aspects of apple scab control directs particular attention to the serious loss that can be caused by the disease, and means are suggested whereby it might be avoided. Certain points in the life cycle of the fungus (*Venturia inaequalis*) are discussed in their bearing on the time of application of sprays for the control of the disease. Spraying for protection against attack is strongly urged, and the value of a "pink bud" application is emphasized. Weak post-blossom sprays can be employed successfully where the pink bud application has been thoroughly made. The number of spray applications to be made is discussed with regard to the particular conditions existing. The significance of factors governing "tree condition" and the bearing this may have on the ultimate results of spraying are pointed out.

Some incidental effects of routine scab-sprays, with special reference to apple fruit sawfly-control: A side light on the interpretation of field spraying experiments, M. H. Moore (*East Malling* [*Kent*] *Res. Sta. Ann. Rpt., 20* (*1932*), *pp. 90–98*).—Routine fungicidal applications designed to control apple scab were advantageous also in control of apple fruit sawfly and brown rot, fruit-tree red spider and apple mildew (these two when sulfur was the fungicide), and, where lead arsenate was included, of various leaf-eating caterpillars. In 1931 sulfur with arsenate dusting proved effective, and for 1932 a "delayed pink bud" routine application of nicotine and soft soap (for capsid control) was suggested as being the cause of virtual lack of sawfly infestation on all trees in spite of a heavy fruit crop.

The data are presented to show how spraying against apple scab can give practical aid of an accessory nature and to emphasize their bearing on the interpretation of the results of field spraying experiments.

Observations on pear scab, R. W. Marsh (*Jour. Pomol. and Hort. Sci., 11 (1933), No. 2, pp. 101–112, figs. 4*).—To previous accounts concerning the development of the scab fungus (*Venturia pyrina*) in pear shoots (E.S.R., 67, p. 553), the author adds new material emphasizing the seasonal succession of the stages of infection. A primary infection takes place during the summer months, resulting in shallow stromata. Spore production occurs, but no tuberculate stromata are formed at this stage. The development of the primary stromata may be restricted to varying extents by the laying down of cork barriers, arising by division of the cortical cells beneath the infected area, before the end of the summer period of shoot growth. In November, shoots commonly show the primary pustule withered or abscinded, with subsidiary stromata beginning to develop under the bark bordering the ends of the original infected area. As no new cork formation takes place in the shoot during winter the parasitizing of the host cells and growth of the subsidiary stromata is able to continue unimpeded. Spore production on the shoots may start in January. Maximum spore dissemination is reached during March or April. After April the numbers and viability of the conidia show a decline. Shoot infection alone can provide amply for spring outbreaks of pear scab. The possibility of infection of opening buds by ascospores is slight.

Experiments were carried out with 4–8–50 Bordeaux as a preblossom spray and with lime-sulfur (1–60 and 1–100) as a postblossom spray. Six sprayings increased the proportion of clean fruit from 2 to 60 percent. Fewer sprayings were unsatisfactory. Sulfur and copper spray damage was pronounced on Doyenné du Comice.—(*Courtsy Biol. Abs.*)

Spraying trials against pear scab (Venturia pyrina): Some practical and theoretical aspects of the interpretation of the results, M. H. Moore (*East Malling [Kent] Res. Sta. Ann. Rpt., 20 (1932), pp. 99–108*).—An account is given of spraying experiments in pear scab control carried out in 1931 and 1932 on the variety Fertility worked on different quince rootstocks. Bordeaux mixture and lime-sulfur both gave good commercial control, but Bordeaux mixture kept more fruits clean by better control of late infection. Colloidal sulfur was not satisfactory. Certain results were obtained, suggesting the action of sulfur "at a distance" under field conditions. Rootstock influence on scab susceptibility in the scion was shown, as with apples, and a differential response of rootstock to Bordeaux spraying was indicated.

The infection of raspberry fruits by the cane-spot fungus, R. V. Harris (*East Malling [Kent] Res. Sta. Ann. Rpt., 20 (1932), pp. 86–89, pl. 1, fig. 1*).—A deformation of the fruits of certain varieties of raspberry occurred over widespread areas of England in 1932 and was found to be due to their infection in an immature condition with the cane spot fungus (*Plectodiscella veneta*). The symptoms of this phase of cane spot attack are described in detail, and its occurrence is correlated with the exceptional weather conditions in the early part of the 1932 season. As to the efficacy of the previously formulated spraying schedule in controlling this form of injury, it is believed that an adequate control of direct fruit injury will be obtained by applying the spray at the "delayed-dormant" and "preblossom" stages.

The commercial control of raspberry-mosaic disease, R. V. Harris and N. H. Grubb (*East Malling [Kent] Res. Sta. Ann. Rpt., 20 (1932), pp. 149–151*).—An investigation of raspberry mosaic started in 1921 at East Malling has indicated that, although the roguing of commercial fruiting plantations is impracticable, a satisfactory control can be achieved by a system of "cane nurseries" established solely as a source of supply of cane free from mosaic virus for planting commercial plantations. Recommendations are given for the planting and maintenance of cane nurseries of the variety Lloyd-George.

Strawberry black root injury, R. H. Roberts (*Wis. Hort., 24 (1933), No. 2, pp. 27, 28*).—As observed at the Wisconsin Experiment Station, the time of applying mulch in autumn had an important bearing on the winter injury to strawberry plants. Measured in yield the following spring, the mulching of Dunlap and Premier plants in early November was most beneficial. Blackened roots were observed in late November in uncovered beds, further indicating that late fall is a critical period in the welfare of the strawberry plant.

The epidemiology of fig spoilage, A. E. Davey and R. E. Smith (*Hilgardia [California Sta.], 7 (1933), No. 13, pp. 523–551, figs. 4*).—Of three types of spoilage distinguished by growers and packers as (1) smut and mold, (2) souring, and (3) endosepsis, and all caused by common saprophytes which invade the central cavity of the fig prior to its ripening, the first two are considered in this discussion. Up to July 1 green but nearly full grown figs with closed eyes were found usually internally sterile, but of those reaching this stage later than July 1 an increasing percentage contained micro-organisms. Bacteria and certain yeastlike fungi were the first organisms to appear in figs with closed eyes. *Alternaria*, *Hormodendrum*, and *Cladosporium* were first found abundantly in figs which reached the nearly full size stage about July 15, and no marked increase was noted thereafter in the percentage of figs of any stage infected with these fungi. Yeasts capable of souring figs were not found until the eyes had commenced to open.

Insects found in developing figs consisted of fig mites, various species of predacious mites, the dried fruit beetle, and the vinegar fly, the last two occurring only in figs with open eyes. Ants were also found in ripening figs in some cases, but no relation could be established between their presence and the spread of smut and mold. Predacious mites, and to a much less extent thrips, were the only living vectors to which the transmission of smut and mold might be attributed. The dried fruit beetle is conceded to be possibly the principal carrier of yeasts.

Introductory notes to a study of citrus scab, H. C. Henricksen (*Puerto Rico Sta. Agr. Notes No. 62 (1932), pp. 3*).—Three methods, namely, spraying, injection, and absorption through the roots, are discussed in relation to citrus scab control. Copper and sulfur fungicides are compared with respect to efficiency and to their ultimate effect on the tree.

A study of citrus scab, H. C. Henricksen (*Puerto Rico Sta. Agr. Notes No. 63 (1932), pp. 4*).—Outlining briefly the history of the disease and tabulating the various species and varieties of citrus with respect to susceptibility, the author discusses certain constituents of the leaf, such as moisture, pigments, oil, wax, acids, glucosides, etc., that might be concerned with resistance. Old leaves, markedly more resistant than young leaves to scab, contained less moisture, less soluble carbohydrates, and soluble proteins and more oil, wax, and pigments. However, it was not established which constituent, if any, was concerned with resistance.

Leafy gall of the chrysanthemum, P. H. Williams (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 18 (1932), pp. 32–39*).—A disease of the chrysanthemum is described, which takes the form of a leafy gall at the base of the stem. A bacterium has been isolated from these galls which resembles *Bacterium tumefaciens* very closely and has produced small galls when inoculated into the stems of various plants. Preliminary experiments on the control of the disease have been carried out in which plants treated with 1 percent sulfuric acid remained entirely free from the disease.

A new disease of dahlias, T. B. POST (*Jour. Wash. Acad. Sci., 23 (1933), No. 4, pp. 203–208, figs. 9*).—Both the pycnidial and sclerotial stages of *Macrophomina phaseoli* were present on diseased stems collected in South Carolina. Spores from pycnidia in the host tissue produced only the sclerotial stage (*Rhizoctonia bataticola*). *M. phaseoli* was later obtained in pure culture, however, perhaps as a saltant of the *R. bataticola*, and it has continued to produce both pycnidia and sclerotia. The conditions under which dahlias may become infected by this organism are not known.—(*Courtesy Biol. Abs.*)

Rose-disease investigations, [III], B. PARSONS and L. M. MASSEY (In *The American Rose Annual. Harrisburg, Pa.: Amer. Rose Soc., 1932, pp. 47–58*).—In the third season of field tests at Cornell University (E.S.R., 67, p. 418) to determine the efficiency of fungicides for the control of black spot, the sulfur dusts were again found to be more efficient than sprays, with the exception of Bordeaux mixture, which was more effective than in 1929 and 1930. The relative inefficiency of sprays may be due to their failure to adhere to the waxy cuticle of the leaf. Brown canker infection was materially reduced by certain sprays and dusts, those materials more effective in the control of black spot being found to be similarly better, in general, in lessening the number of cankers on the canes. Fungicides containing sulfur were more effective than those depending on copper for toxicity.

The adhesiveness of sulphur fungicides to rose-foliage, R. P. WHITE (In *The American Rose Annual. Harrisburg, Pa.: Amer. Rose Soc., 1932, pp. 59–64, fig. 1*).—Data obtained at the New Jersey Experiment Stations indicated that the percentage of defoliation is directly correlated with the percentage of infection with black spot, and both were indirectly correlated with percentage of healthy foliage in the 10 varieties tested over a period of three years. Addition of arsenate of lead to sulfur dusts decreased their adhesiveness. Sulfur dusts were lost at equal rates from rose foliage when the dusts were applied on dry foliage or on foliage wet with dew, but coverage was more uniform and effective on dry foliage. Adhesiveness of sulfur dusts was correlated with size of particles—the finer the dusts, the greater the adherence. Control of black spot and brown canker was directly correlated with adhesiveness of sulfur dust or spray used, other factors being equal.

Under the conditions of the tests, conducted under normal field circumstances, the wettable sulfur sprays adhered better to foliage than the best of the sulfur dusts.

Leaf-curl in Zinnia elegans at Dehra Dun, R. N. MATHUR (*Indian Jour. Agr. Sci., 3 (1933), No. 1, pp. 89–96, pls. 2*).—Leaf curl, a virus disease, is described and shown to be transmitted by the white fly *Bemisia gossypiperda*. The symptoms are similar to those of the leaf curl of cotton. Both diseases are spread by the same insect, and they may perhaps be identical.—(*Courtesy Biol. Abs.*)

Elm disease [trans. title], C. BUISMAN (*Tijdschr. Nederland. Heidemaatsch., 45 (1933), No. 7, pp. 219–237, figs. 10*).—This paper is a popular account of the present status of the elm disease caused by *Ceratostomella* (*Graphium*) *ulmi*. The symptoms of the disease, its range, and the damages done by it are described, together with some characteristics of the causal agent. The biology of the elm bark beetles *Scolytus scolytus* and *S. multistriatus* that carry the disease is briefly discussed.

In the Netherlands two ways of fighting the disease are being followed: (1) The removal of dead and nearly dead elm trees and the burning of their bark to kill the bark beetles that carry the disease, and (2) the search for resistant species and individuals of the elm tree. Up to now some resistant species (all of them originating from eastern Asia) and several resistant individuals of the common European elm (*U[lmus] foliacea*) have been found.—(*Courtesy Biol. Abs.*)

The influence of physical properties on the control of pine needle drop by copper-lime and copper-soda mixtures [trans. title], E. HOFFMANN (*Deut. Forst. Ztg., 48 (1933), Nos. 25, pp. 521–524; 26, pp. 545–549*).—Tests of the adhesiveness and ability to remain in suspension of Bordeaux mixture prepared by various formulas and of copper-soda mixtures showed that Bordeaux mixture is much superior in both respects. The most satisfactory mixture consisted of 1 kg $CuSO_4$, 1 kg unslaked lime, 100 l water, and a small amount of casein.—(*Courtesy Biol. Abs.*)

Note on poplar canker [trans. title], R. REGNIER (*Bul. Soc. Cent. Forest. Belg., 37 (1930), No. 8, pp. 362–365*).—Poplar canker (*Micrococcus populi*) is now severe in many parts of France. In general, it attacks the faster growing varieties, causing slower growth and sometimes death and rendering the wood worthless even for firewood. Treatment of superficial cankers with Bordeaux mixture or even whitewash has proved effective in young stands under 15 years of age, but with older stands the affected parts must be cut and burned. Attacked stands should be cut as rapidly as possible, and new stands should be started only with varieties known to be resistant to this disease. So far *Populus alba*, *P. alba canescens.*, and *P. pyramidalis* have not been attacked.—(*Courtesy Biol. Abs.*)

Annual report, pathological division, A. SHARPLES (*Rubber Res. Inst. Malaya, Ann. Rpt., 1932, pp. 94–102*).—This is a progress report on research by the pathological division on treatment of pruned surfaces of large budded stocks; *Hevea* leaf mildew (*Oidium heveae*); root diseases due to *Fomes lignosus*, *Ganoderma pseudoferreum*, and *Sphaerostilbe repens;* control of moldy rot; *Psilopholis grandis*, *Coptotermes curvignathus* Holmg. and other insect pests; pink disease; mites and *Gloeosporium;* and pathology of rubber under "forest" conditions.

Chemical control of sap-stain and mold in green lumber and logs, R. BUHAY (*Making Echo, 12 (1933), No. 2, pp. 64–78*).—An account is given in mimeographed form of experiments in control of sap stain (caused by *Graphium* sp.) and mold (*Fusarium* sp.) in seven light-colored Philippine woods by dipping in solutions of "lignasan" (a patented compound containing 4.3 percent ethyl mercury chloride), and various other chemicals (5 percent solution crude cresylic acid, 10 percent $NaHCO_3$, 1.5 percent $HgCl_2$, 5 percent $As_2O_3+HgCl_2$). For six of the woods lignasan was the most effective preventive of both mold and stain and did not discolor the lumber as did cresylic acid and $NaHCO_3$. Cresylic acid, $HgCl_2$, and $NaHCO_3$ ranked second, third, and fourth in effectiveness. The samples treated with the arsenious oxide mixture were more heavily attacked than untreated control samples.—(*Courtesy Biol. Abs.*)

ECONOMIC ZOOLOGY—ENTOMOLOGY

Mimicry, G. D. HALE CARPENTER and E. B. FORD (*London: Methuen & Co., 1933, pp. IX+134, pls. 2*).—An abbreviated account in handy pocket form.

Winter feeding of wild life on northern farms, W. B. GRANGE (*U.S. Dept. Agr., Misc. Pub. 159 (1933), pp. 12, figs. 6*).—In this practical account attention is called to the importance of winter food for birds and other wild life, natural foods and their deficiency in winter, organizing a winter-feeding campaign, convenient sources of food, feeding stations, permanent feed patches, permanent shelters, temporary or emergency feeding, natural windbreaks and shelters, providing grit at stations, feeding game mammals, predators near feeding stations, and planning for the succeeding year.

Cave life of Kentucky, mainly in the Mammoth Cave region, V. Bailey (*Amer. Midland Nat., 14 (1933), No. 5, pp. 385–635, figs. 90*).—This contribution from the U.S.D.A. Bureau of Biological Survey and the Kentucky State Geological Survey, cooperating, on the animal life in the Kentucky cave region includes chapters on some of the birds of the Mammoth Cave region, by F. M. Bailey (pp. 463–574), and the invertebrate life of Mammoth and other neighboring caves, by L. Giovannoli (pp. 600–623). Following an introductory part, the work deals with the mammals (pp. 410–462), birds (pp. 463–574), fishes (pp. 575–586), reptiles (pp. 587–593), amphibians (pp. 594–599), and invertebrates (pp. 600–623). An 11-page list of references to the literature is included.

Damage by deer to crops in California, G. H. True, Jr. (*Calif. Dept. Agr. Mo. Bul., 22 (1933), No. 1, pp. 94–100*).—This account includes tabulated data showing the financial loss due to deer damage to various individuals and counties in California, with information on the crops thus damaged.

Factors affecting the breeding of the field mouse (Microtus agrestis).—III, Locality, J. R. Baker and R. M. Ranson (*Roy. Soc. [London], Proc., Ser. B, 113 (1933), No. B 784, pp. 486–495, figs. 5*).—In this third contribution (E.S.R., 68, p. 777), "the breeding of *M. agrestis* was studied in three areas about equally distant on a nearly north and south line about 360 miles long. Mice were collected each month for two years and the reproductive organs studied. Altogether 2,500 mice were dissected. The breeding season lasts from February or March to September or October. During the winter the species is represented, so far as males are concerned, entirely by small, immature specimens less than a year old. They become fecund next spring and die in the autumn or early winter. The majority of the mature females also die in autumn or early winter. Breeding starts latest in the most southerly of the three areas and continues latest in the most northerly. This has not been explained. There exists a general correlation between the hours of sunshine per month and the breeding condition of the mice. No correlation was found between temperature or rainfall and breeding."

The life histories and ecology of jack rabbits, Lepus alleni and Lepus californicus ssp., in relation to grazing in Arizona, C. T. Vorhies and W. P. Taylor (*Arizona Sta. Tech. Bul. 49 (1933), pp. 471–587, pls. 12, figs. 5*).—Studies of jack rabbits are here reported, conducted cooperatively by the station and the U.S.D.A. Bureau of Biological Survey. Following an introduction (pp. 471–473), the headings are given of identification, distribution and habitat, general habits, breeding habits, food, enemies, parasites and diseases, numbers, economic status, and control, with a summary and a five-page bibliography.

The two jack rabbits indigenous to the station region in southern Arizona are *L. alleni*, known as the antelope jack rabbit, which averages 8 lb. in weight, and *L. californicus eremicus*, the Arizona jack rabbit, averaging 5.5 lb. It is pointed out that jack rabbits are readily separable from all other rabbits by structural characters and habits, the antelope jack rabbit being readily distinguishable by its long white-edged ears and white sides from the gray-sided jack rabbits (*L. californicus* subspp.), which have black-tipped ears and gray sides.

L. alleni is chiefly Mexican in distribution, occurring within the United States in only a small part of southern Arizona. It inhabits somewhat open country chiefly below the 4,500 ft. altitude. The *L. californicus* group of jack rabbits occurs over practically the whole of the western United States, from the upper Arid Tropical to the Transition Zone. *L. alleni* shows some tendency to gregariousness, but in *L. californicus* there is little or no such tendency. There is no evidence of hybridization between the two species.

Calculations indicate that it takes 15 *L. alleni* to eat as much valuable forage as 1 sheep, or 74 as much as 1 cow, and twice as many *L. californicus* as *L. alleni* to consume the same amounts. In the experimental plats on the Santa Rita Range jack rabbits and rodents were apparently mainly responsible for holding the vegetation in a preclimax condition, preventing attainment of the climax grass stage. "Stomach analyses available indicate that 36 percent of the food of *L. alleni* is mesquite and 45 percent grass, and that *L. californicus* consumes 56 percent of mesquite and only 24 percent of grass. . . . Unfortunately stomach analyses do not give an adequate idea of weeds consumed. It is probable these figures by themselves would lead one to seriously underestimate the rabbit's actual liking for and consumption of weeds. The evident fondness of rabbits for grass when available probably favors the encroachment on grass ranges of mesquite, cholla cactus, weeds, and other species. It is estimated that jack rabbits consume less than 3 percent of the potential production of grass on the Santa Rita Range."

Flesh eaters, as the coyote, bobcat, and numerous other mammals, and a wide variety of hawks and owls, feed quite regularly on jack rabbit and under normal conditions help to prevent overpopulation. Jack rabbits are commonly infested with parasites, of which *Cuterebra* larvae (warbles), ticks, and tapeworm cysts are most common. Fleas are fairly abundant. Tularemia, to which humans are also susceptible, is the most important germ disease of rabbits so far as known. There is little evidence that any of these materially affect the numbers of jack rabbits in southern Arizona.

Several methods of enumerating jack rabbits were tested and checked against each other. The number of these animals on the 50,000 acres of the Santa Rita Range is probably between 5,000 and 10,000. The jack rabbits are estimated to weigh only 7 percent as much as the cattle on the range.

Consumption of grass by jack rabbits varies inversely with consumption of mesquite and cactus. Conservative handling of grazing ranges, including stocking for the worst years rather than the best or even the average years, and retention of a normal population of flesh eaters may ordinarily be counted on to obviate serious rabbit injury. Under conditions of overgrazing and of misapplied control of predators, there is almost sure to be a jack rabbit and rodent problem.

Rats as carriers of disease, A. Spicer (*Vet. Rec., 13 (1933), No. 33, pp. 812, 813*).—This brief discussion includes references to mastitis, ringworm, contagious abortion, tuberculosis, and abortion in mares.

Early life of the thirteen-lined ground squirrel, G. E. Johnson (*Kans. Acad. Sci. Trans., 34 (1931), pp. 282–290, figs. 14*).—This contribution from the Kansas Experiment Station reports observations on changes in form and weight of young ground squirrels found in western Kansas, *Citellus tridecemlineatus pallidus* (Allen).

The weasels of New York: Their natural history and economic status, W. J. Hamilton, Jr. (*Amer. Midland Nat., 14 (1933), No. 4, pp. 289–344, pls. 4, figs. 7*).—The studies here reported relate to observations of the life history of two widespread weasels, the New York weasel *Mustela noveboracensis* and the little brown weasel *M. cicognanii*, chiefly in New York State. The account deals with their general habits, relative numbers, ratio of sexes, manner of color change, period of fall color change, period of spring molt, procedure of fall molt in captive weasels, manner of spring molt, enemies, breeding habits, food, and care of caged weasels for study purposes. Small mammals have been found to be the chief article of food eaten throughout the year, mice forming by far the largest part. The findings of examinations made of the visceral contents of over 400 weasels collected during the years 1928–32 are reported upon. Of those containing recognizable remains, 163 were from *M. noveboracensis* and 191 *M. cicognanii.*

Contribution to the biology and ecology of the starling (Sturnus vulgaris vulgaris L.) during its reproductive period [trans. title], H. N. KLUIJVER (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 69 (1933), pp. [2]+146, pls. 3, figs. 6; Eng. abs., pp. 137–139*).—This is a report of a study made of the biology and ecology of the starling based upon a colony of birds in nest boxes. The account is accompanied by a six-page list of references to the literature.

The giant snail Achatina fulica Fer. [trans. title], S. LEEFMANS and J. VAN DER VECHT (*Landbouw [Buitenzorg], 8 (1933), No. 10, pp. 668–677, pls. 2; Eng. abs. p. 677*).—The authors report the invasion of the Netherland East Indies by *A. fulica.* It had previously been found only on the Island of Poelau Bintan of the Rhio Archipelago, where it had been imported from Singapore. Though known to attack several cultivated plants, it has not caused any appreciable damage, acting mainly as a scavenger.

Insects: A book for teachers, students, and all others interested in the vast world of the six-footed, edited by G. PICKWELL, C. D. DUNCAN, K. S. HAZELTINE, and E. SMITH (*Los Angeles, Calif.: Suttonhouse, 1933, pp. XV+304, figs. 139*).—A textbook presented in 20 chapters.

Determination of the surface of insects, W. A. SIMANTON (*Ann. Ent. Soc. Amer., 26 (1933), No. 2, pp. 247–254, figs. 3*).—A practical method developed for determining the surface area of insects consists in dissecting and compressing the body and measuring the areas of the parts by means of a calibrated microscope.

"Formulas have been fitted to the measurements obtaind by the above method of observation by which the surface area of two species of insects may be calculated from the body weight. The formula determined for *Blattella germanica*, the German cockroach, is $S=12.17\ W^{0.63}$ and that for *Aphis rumicis*, the bean aphid, $S=3.28\ W^{0.60}$. The method of obtaining these formulas has been described and illustrated. The results obtained with the two insects compare very favorably with the results previously obtained with higher animals, regarding both accuracy of method and similarity of formulas."

[Notes on economic insects and insecticides] (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 977, 994–1000*).—The contributions presented (E.S.R., 69, p. 824) are as follows: Aphis Lion [*Chrysopa* sp.] Predators of the Potato Psyllid [*Paratrioza cockerelli* (Sulc.)], by G. F. Knowlton (p. 977); Beech Injured by Borers [*Xylotrechus quadrimaculatus* Hald.] (p. 977), Chinch Bug (*Blissus leucopterus* Say) (p. 994), and The Pine Tip Beetle (*Pityophthorus pulicarius* Zimm.) (pp. 994, 995), all by E. P. Felt; Reappearance of the Colorado Potato Beetle in Utah, by G. F. Knowlton (p. 995); Preparation of Derris Extract Sprays, by H. H. Richardson (p. 995); Specific Defoliation Data on Apple, by C. R. Cutright (pp. 995, 996); The Past and Present Status of Fluorine Containing Insecticides, by C. M. Gwin (pp. 996, 997); The Use of the Term "Pyrethrin" by Entomologists, by H. H. Shepard (pp. 997, 998); and The Honey Bees of Africa, by T. D. A. Cockerell (pp. 998–1000).

[Contributions on economic insects in California] (*Calif. Dept. Agr. Mo. Bul., 22 (1933), No. 2–3, pp. 113–178, figs. 34*).—The contributions here presented include the following: Removal of Spray Residue from Canning Peaches Sprayed for Peach Twig Borer Control, by H. K. Plank (pp. 113–130); Forest Insects of the Year 1932, by K. A. Salman (pp. 131–137); Spraying for Control of Beet Leafhopper in Central California in 1931, by W. C. Cook (pp. 138–141); A Comparative Study of the Species of *Eumerus* Known as the Lesser

Bulb Flies, by R. Latta and F. R. Cole (pp. 142–152); A Pest of Sierra Plums [*Mineola scitulella* Hulst.], by E. O. Essig and H. H. Keifer (pp. 153–155); Notes for 1932 on Cereal and Forage Insects in California, by W. B. Cartwright, R. A. Blanchard, and C. C. Wilson (pp. 156–160); Feeding Mechanisms of Weevils, Their Function and Relationship to Classification, by P. C. Ting (pp. 161–165); Walnut Aphis Control, by W. H. Wright (pp. 166–169); and A Review of Codling Moth Control Measures, by S. Lockwood (pp. 170–178).

[Work in economic entomology at the Kentucky Station] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 55–57*).—The work under way at the station here referred to includes leafhopper studies and codling moth and spray studies.

[Report of work in entomology at the Missouri Station] (*Missouri Sta. Bul. 328 (1933), pp. 27–30, 34, 35, fig. 1*).—The work of the year noted (E.S.R., 67, p. 424) includes the establishment of a State-wide series of codling moth breeding cages; the effect of latitude, longitude, elevation, and exposure on codling moth development; bait traps to supplement breeding cages for the codling moth; the use of tree bands for determining late brood moth activity; spray for control of apple worms; chemically treated bands as a supplement to spray control of the codling moth; the lethal action of arsenic on codling moth larvae; tarnished plant bug control; spraying for strawberry crown borer control; and the use of barium fluosilicate, synthetic cryolite, calcium arsenate, pyrethrum, and homemade soft soap as insecticides, all by L. Haseman and P. H. Johnson; Hessian fly-resistant varieties of wheat and periodical recurrence of insect pests, both by Haseman; control of insect pests of melons, by Haseman and P. B. McCall; and substitutes for arsenical spray, by T. J. Talbert, H. G. Swartwout, and C. G. Vinson.

[Ninth biennial report of the Montana State Board of Entomology, 1931–32] (*Mont. State Bd. Ent. Bien. Rpt., 9 (1931–32), pp. 47, figs. 2*).—This report (E.S.R., 65, p. 546) includes the following contributions: Control Work—Rocky Mountain Spotted Fever Control Districts, Bitter Root Valley, for the Biennium Ending December 31, 1932, by F. J. O'Donnell (pp. 7–11); Rocky Mountain Spotted Fever in Montana, 1914–1932 (pp. 12–16); Future Work of the State Board of Entomology (pp. 16, 17); and A Chronological Summary of the Investigations on Rocky Mountain Spotted Fever with Especial Reference to the Work in Montana, by A. L. Strand (pp. 18–33), together with a bibliography of 13 pages (pp. 35–47).

Insect conditions in Puerto Rico during the fiscal year, July 1, 1930, thru June 30, 1931, M. D. Leonard (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 2, pp. 121–144*).—This is a second contribution from the Puerto Rico Insular Experiment Station in which the economic insects of the year are noted under their respective hosts (E.S.R., 66, p. 247).

Notes on insect conditions in Puerto Rico for the fiscal year, July 1931 thru June 1932, M. D. Leonard (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 2, pp. 97–137*).—This continues the report noted above.

[Report of work in entomology at the Tennessee Station], S. Marcovitch (*Tennessee Sta. Rpt. 1932, pp. 32–34*).—A brief statement is made of the work of the year (E.S.R., 68, p. 215), including spraying experiments on peach, woolly apple aphid, cutworms and the cabbage looper, grasshoppers (American grasshopper and the red-legged grasshopper), and the more important insect pests in 1932.

[Report of work in economic entomology in Texas] (*Texas Sta. Rpt. 1932, pp. 31–41, 100–102, 142, 143, 199, 200, 207, 208, 223*).—Work with economic insects conducted during the year (E.S.R., 67, p. 705) includes that with the sorghum webworm, ingestion of poison by the cotton boll weevil, and cotton flea hopper hibernation, all by H. J. Reinhard; boll weevil hibernation, in cooperation with the U.S.D.A. Bureau of Entomology, by Reinhard, E. W. Dunnam, and R. W. Moreland; cotton flea hopper, by F. L. Thomas, J. C. Gaines, and F. F. Bibby; pink bollworm, in cooperation with the U.S.D.A. Bureau of Entomology, by F. A. Fenton and W. L. Owen, Jr.; cotton bollworm, in cooperation with the U.S.D.A. Bureau of Entomology, by Thomas, R. K. Fletcher, S. W. Bromley, and Dunnam; use of sulfur as an insecticide against the common red spider, by J. N. Roney; the pecan nut casebearer, by S. W. Bilsing; apiary inspection 1921–32, by Thomas and C. E. Heard; aphid injury to truck crops, by Roney and Thomas; fig borers, by Roney and Reinhard; weevil injury to onions and garlic and seed-corn maggot on spinach, by Thomas; activities of bees, bee relationship, and horsemint for honey and oil production, all by H. B. Parks; honey plants; queen breeding and bee products, by A. H. Alex and Parks; the sugarcane moth borer and sugarcane beetle, conducted in cooperation with the U.S.D.A. Bureau of Entomology at the Beaumont Substation, by A. I. Balzer; insects affecting animals, in cooperation with the U.S.D.A. Bureau of Entomology at the Sonora Substation, including goat lice, blowflies, and goat scabies (in cooperation with the Livestock Sanitary Commission), all by O. G. Babcock and I. B. Boughton; the citrus rust mite, red spiders, the leaf-footed bug, the palm beetle *Strategus julianus* Burm. and the onion thrips, all by S. W. Clark at the Weslaco Substation; and insects and diseases at the Winter Haven Substation, by E. Mortensen.

Insect pests of crops, 1928–1931, J. C. F. Fryer, C. T. Gimingham, and A. S. Buckhurst (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 66 (1933), pp. VI+50, fig. 1*).—This general account of pests affecting various farm crops is in continuation of that previously noted (E.S.R., 60, p. 161). A list is given of the papers relating to the subject published in Great Britain and Ireland during 1928–31, also an index to the pests involved.

Annual report of the entomologist for the year 1932, H. M. Morris (*Cyprus Dept. Agr. Ann. Rpt., 1932, pp. 39–43*).—The occurrence of and work with the more important insects of the year and work with rat destruction are reported upon.

Report on the work of the entomological division, J. C. Hutson (*Ceylon Admin. Rpts., Sect. IV, Dept. Agr., 1932, pp. D123–D133*).—In this report (E.S.R., 68, p. 781) particular attention is given to termites and their control.

Report on the work of the division of plant pest control, F. P. Jepson (*Ceylon Admin. Rpts., Sect. IV, Dept. Agr., 1932, pp. D107–D115*).—Particular attention is given in this account to the insect pests of plants and control work under way.

Report of the imperial entomologist, P. V. Isaac (*Imp. Inst. Agr. Res., Pusa, Sci. Rpts., 1931–32, pp. 141–145*).—A brief statement is made of the work under way during the year with insect pests.

Seed pests of broccoli (*Seale-Hayne Agr. Col. Pam. 40 (1933), pp. 11–13, figs. 3*).—Brief mention is made of the turnip weevil *Ceutorhynchus assimilis*, the blossom beetle *Melegethes aeneus*, and the diamondback moth as enemies of broccoli seed in Devon and Cornwall Counties, England.

The effect of certain homopterous insects as compared with three common mirids upon the growth and fruiting of cotton plants, K. P. Ewing and R. L. McGarr (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 943–953, pls. 3*).—Cage experiments extending over a period of three years with four homopterous insects, namely, *Homalodisca triquetra* Fab., *Oncometopia undata* Fab., *Graphocephala versuta*, and *Stictocephala festina*, showed that none of these species, when allowed to feed on cotton plants, was able materially to reduce the normal production of fruit of the plants or cause typical hopper damage, as did three species of mirids (the cotton flea hopper, the tarnished plant bug, and *Adelphocoris rapidus* Say).

Insect and other injuries to potato tubers, G. F. MacLeod and W. A. Rawlins (*New York Cornell Sta. Bul. 569* (*1933*), *pp. 14, figs. 9*).—The injuries caused by insects and several other invertebrate pests are described and illustrated.

Principal insects and diseases of Azalea indica [trans. title] (*Min. Agr.* [*Belgium*], *Off. Hort., Sér. Phytopath. No. 3* (*1933*), *pp. 18, pls. 4, figs. 6*).—The insects here considered include the greenhouse thrips, the azalea tineid or miner *Gracilaria azaleella* Brants., and the azalea tortricid or leaf roller *Oxygrapha* (*Acalla*) *schalleriana* F. S. The life stages and injuries of all of these are illustrated by colored plates.

Symposium on insecticides (*Indus. and Engin. Chem.*, *25* (*1933*), *No. 6, pp. 616–644, figs. 3*).—This symposium (E.S.R., 68, p. 717) included the following contributions: Removal of Poisonous Spray Residues on Fruit, by R. H. Robinson (pp. 616–620); Poisonous Spray Residues on Vegetables, by W. B. White (pp. 621–623); Significance and Danger of Spray Residue, by C. N. Myers, B. Throne, F. Gustafson, and J. Kingsbury (pp. 624–628); Control of Insects on Plants by Chemical Means—Recent Developments, by E. B. Alvord and H. F. Dietz (pp. 629–632); Selenium—Insecticide Material for Controlling Red Spider, by C. B. Gnadinger (pp. 633–637); Insecticidal Activity of Aliphatic Thiocyanates—II, Mealy Bug, by D. F. Murphy and C. H. Peet (pp. 638, 639) (E.S.R., 67, p. 53); Rotenone, by R. C. Roark (pp. 639–642); and Commercial Aspect and Future Possibilities of Rotenone, by R. W. Birdsall (pp. 642–644).

Carboxide gas: A new insecticidal fumigant for bedbugs and cockroaches, E. W. Brown (*U.S. Naval Med. Bul.*, *31* (*1933*), *No. 3, pp. 253–268, pls. 3*).—This is an account of tests made of a mixture of ethylene oxide and carbon dioxide, known commercially as Carboxide, compressed in cylinders in liquid form in the ratio of 1 part of ethylene oxide to 9 parts of carbon dioxide by weight. The present account reports upon tests of the minimum lethal dosage of Carboxide gas for bedbugs and cockroaches under conditions requiring deep penetration for such periods of exposure as would be practicable on board ship without material interference with normal routine activities.

The tests were conducted with bedbugs with the dosages in pounds per 1,000 cu. ft. with the following results: 24-hour exposure, 2½ and 2 lb.—both completely lethal; 18-hour exposure, 10, 7½, 5, 2½, and 2 lb.—all completely lethal; 12-hour exposure, 4 and 3 lb.—both completely lethal; 6-hour exposure, 12, 9, 6, 4, and 3 lb.—all completely lethal; and 3-hour exposure, 18, 12, 9, 7, 6, 5, 4, and 2 lb.—completely lethal down to and including 5 lb., incomplete or negative at 4 and 2 lb.

The results obtained with tests with cockroaches are as follows: 12-hour exposure, 4 lb.—lethal; 6-hour exposure, 9, 6, and 4 lb.—all completely lethal; and 3-hour exposure, 9, 6, and 4 lb.—all completely lethal.

The minimum lethal concentrations per 1,000 cu. ft., in a relatively airtight space, recommended by the author for bedbugs and cockroaches are 5 lb. for 3 hours, 3 lb. for 6 hours, 3 lb. for 12 hours, 2 lb. for 18 hours, and 2 lb. for 24 hours.

It is pointed out that Carboxide gas is noninflammable and nonexplosive; noninjurious to fabrics, furniture, or food products; of about one thirty-seventh to one sixtieth of the toxicity of hydrocyanic acid gas for man; and is not prohibitive from the standpoint of cost.

Selenium as an insecticide, E. M. Nelson, A. M. Hurd-Karrer, and W. O. Robinson (*Science*, *78* (*1933*), *No. 2015, p. 124*).—Attention is called to the danger of using selenium as an insecticide, since if present in the soil it is assimilated by plants from which a particularly toxic compound is elaborated. Ffteen p.p.m. of selenium in the soil, added as sodium selenate, and under some conditions even lower concentrations, produce distinct chlorosis and stunting of wheat plants. "Quantities as small as 1 p.p.m. permit growth and maturation with no visible symptoms of injury to the plant. However, when the grain or straw from such plants is fed to experimental animals, such as rats and guinea pigs, it produces a pronounced toxicosis characterized by retardation in growth, and death occurs in a few weeks. Wheat which has been found by analysis to contain 8 to 10 p.p.m. of selenium absorbed from the soil produces fatal injury with, in many cases, readily detectable macroscopic changes in the liver. Selenium is present in the grain in intimate association with the protein, but in what form has not yet been determined."

The economic importance of Collembola, J. W. Folsom (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 934–939*).—In this contribution the most serious kinds of damage by springtails are described, and all the known injurious species, 43 in number, are listed. A list of 35 references to the literature is included.

Injury to buildings by termites, T. E. Snyder (*U.S. Dept. Agr. Leaflet 101 (1933), pp. 8, figs. 3*).—This practical account is a complete revision of and supersedes Leaflet 31, previously noted (E.S.R., 62, p. 56).

The composition of different regions of mounds of Eutermes exitiosus Hill, F. G. Holdaway (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *6 (1933), No. 3, pp. 160–165, figs. 2*).—In analyses of five mounds the variation in composition of the inner wall was found to be small and only slightly more than that of the nursery.

An analysis of termite (Eutermes exitiosus) mound material, W. E. Cohen (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *6 (1933), No. 3, pp. 166–169*).—The studies reported showed the cellulose in the wood attacked by the termites to be very considerably degraded, as evidenced by the high percentage of material soluble in weak sodium hydroxide solution and the low percentage of cellulose in the organic matter. The percentage of lignin was, however, of the same order of magnitude expected in wood substance and appeared to have been little altered.

Plowing to control grasshoppers, J. A. Munro (*North Dakota Sta. Circ. 52 (1933), pp. [4], figs. 3*).—In this practical account attention is called to the fact that the grasshoppers so abundant and destructive in the State, of which the lesser migratory grasshopper (*Melanoplus mexicanus* Sauss.) is the most widespread and injurious, should be combated by plowing during the fall or in the early spring before May 15. Plowing does not destroy the eggs, but when buried deeper than 3.5 in. the young hoppers hatching therefrom are unable to work up from the soil if it be fairly compact. In order to insure the eggs being buried sufficiently deep, furrows should be plowed to a depth of at least 4 in.

Fight grasshoppers by plowing stubble, J. R. Parker (*U.S. Dept. Agr. Circ. 302 (1933), pp. 4, figs. 3*).—In this practical account the author calls attention to the importance of plowing grain and flax stubble in grasshopper-infested areas before May 15 to prevent young grasshoppers from reaching the surface.

Thrips investigation.—I, The seasonal fluctuations in numbers of Thrips imaginis Bagnall and associated blossom thrips, J. W. Evans (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *6 (1933), No. 3, pp. 145–159, figs. 6*).—This is a report of investigations being made of the seasonal fluctuations in numbers of *T. imaginis* and associated blossom thrips in the vicinity of Adelaide, South Australia, with a view to determining the factors responsible for their infestations by means of the correlation of the rises and falls of the populations with meteorological conditions.

A new genus and species of Anthocoridae (Hemiptera) from New Zealand, W. E. China (*Ann. and Mag. Nat. Hist., 10. ser., 11 (1933), No. 64, pp. 514–518, fig. 1*).—Following the erection of the genus *Maoricoris* and descriptions of two new species, notes are presented on the habits of the family. It is concluded that probably all the Anthocoridae are predacious on the eggs and larvae of other insects, and even on the adults of smaller forms, such as Aphididae and Coccidae. In many cases they also supplement their diet with the sap of plants. Attention is called to the fact that *Lyctocoris campestris*, commonly found in stables and cattle sheds, has been recorded by Reuter as sucking the blood of horses and cattle and may possibly transmit the virus of foot-and-mouth disease.

The control of Antestia in wetter districts: Notes on a paraffin-pyrethrum-soap emulsion spray, F. B. Notley (*Kenya Dept. Agr. Bul. 4 (1933), pp. 12*).—A pyrethrum-soap emulsion spray is suggested for use in combating *A. faceta* Germ. on coffee in wet districts where arsenite-molasses baiting has been found ineffective.

A study of the cotton flea hopper, with special reference to the spring emergence, dispersal, and population, J. C. Gaines (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 963–971, figs. 6*).—It was found in three years' observations at the Texas Experiment Station that the population of the cotton flea hopper is increased by a rainfall which produces a rapid growth of the host plants Early fall rains, which promote the growth of fall weeds, are influential in determining the number of insects that emerge the following spring. Time of spring emergence and dispersal are factors that influence the population in cotton.

Damage to the cotton plant caused by Megalopsallus atriplicis Kngt. and other species of Miridae, R. L. McGarr (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 953–956*).—It was found in the experiments conducted that "*M. atriplicis*, when allowed to feed on cotton, causes blasting or abortion of the young squares and induces swellings and lesions on the stems and petioles and malformation of the leaves, and that *Psallus biguttulatus*, *P. pictipes*, *Reuteroscopus ornatus*, *Lygus cristatus*, *M. latifrons*, and *Melanotrichus leviculus* cause swellings and lesions on the stems and petioles similar to those produced by *P. seriatus* [the cotton flea hopper]."

A classification of North American agallian leaf hoppers, P. W. Oman (*U.S. Dept. Agr., Tech. Bul. 372 (1933), pp. 94, pls. 4, figs. 18*).—Following a brief introduction and history and a discussion of relationships, economic importance of the group, characters used in the classification, and technic used in the study, keys are given to the genera of agallian leafhoppers. Keys for separation and descriptions are given for 23 forms of *Agalliopsis*, of which 13 are new, 26 of *Agallia*, of which 12 are new, 33 of *Aceratagallia*, of which 24 are new, and 1 of *Agalliana*, a genus here erected for *Bythoscopus sticticollis* Stål. There are drawings of all species and photographic enlargements of 48 species. A list of 45 references to the literature is included.

New species of aphids from Colorado, C. P. Gillette and M. A. Palmer (*Ann. Ent. Soc. Amer., 26 (1933), No. 2, pp. 348–367, figs. 11*).—In this contribution from the Colorado Experiment Station the authors describe 11 new species representing 5 genera.

A study of the effect of accessory substances on the adherence of lime sulfur spray to the integuments of pine leaf scale, Chionaspis pinifoliae (Fitch), W. W. Yates (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 989–994*).—In work in Oregon a number of common spreaders and adherents were tested out in lime-sulfur spray for their effect in increasing or decreasing the amount of adhering spray solution on the integuments of *C. pinifoliae*. "The method used in estimating the relative value of the various combinations was to determine quantitatively, by an adapted colorimetric method, the residual sulfur left deposited on 50 scales. It is apparent from the experimental results that the correct amount of accessory material to use is important and will depend upon the nature of the surface covered. The integument of the pine leaf scale is not difficult to wet. The use of an excessive amount of certain materials with lime-sulfur resulted in a reduction in the amount of adhering sulfur. From an economic standpoint, it is evident that the use of an excessive amount of accessory material in a spray is a more serious error than the use of too little material."

A method for timing sprays for the control of scale insects on citrus, L. L. ENGLISH and G. F. TURNIPSEED (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 987–989, pl. 1, fig. 1*).—In studies by the Alabama Experiment Station sprays for the control of scale insects were effectively timed from weekly records of the abundance of crawlers. Such records were made by counting the number of crawlers caught in removable tanglefoot bands placed on infested branches of Satsuma orange.

Three species of Empoasca leafhoppers known to affect economic plants in Haiti (including the description of two new species), D. M. DELONG (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 2, pp. 113–115, pl. 1*).—*E. fabalis* DeL., *E. gossypii*, and *E. canavalia* are noted, the two latter being described as new to science.

The shoot caterpillar of black pepper [trans. title], J. VAN DER VECHT (*Landbouw [Buitenzorg], 8 (1933), No. 10, pp. 661–667, fig. 1; Eng. abs., p. 667*).—In this contribution a brief description of the several stages and notes on the life history of *Laspeyresia hemidoxa* Meyr., injurious to young black pepper plants (*Piper nigrum*) in Bangka (Banka), are presented.

The European pine shoot moth (Rhyacionia buoliana Schiff.), with special reference to its occurrence in the Eli Whitney Forest, R. B. FRIEND and A. S. WEST, JR. (*Yale Univ. School Forestry Bul. 37 (1933), pp. V+65, pls. 9, figs. 11*).—Following an introduction, the authors deal with the systematic position, incidence in Europe, occurrence in North America, geographic distribution, host plants, description of the insect, life cycle and habits (pp. 16–33), relation to white pine stands (pp. 33–49), and control (pp. 49–60). A four-page list of references to the literature is included.

Sugarcane borer effect upon value of seed cane, W. E. HINDS and B. A. OSTERBERGER (*Louisiana Stas. Bul. 240 (1933), pp. 11*).—The studies conducted in 1929 and 1932 indicate that as sugarcane borer infestation increases in seed cane of any variety there is a somewhat correspondingly close relationship to the increase in the "skips" or unoccupied stretches of row in the field. "There is a corresponding decrease in the number of early developed sprouts or a retardation in the germination of the cane. There is a distinct reduction in the number of stalks maturing for harvest. The decrease in yield varies decidedly with different varieties, and may range up to a loss of upward of 7 tons of cane per acre in the more heavily infested seed plats and with the more susceptible varieties of cane. The factor of borer-free seed is less important in the more vigorous-growing varieties of cane, but even in these varieties it is still decidedly important. Every reasonable effort to secure seed cane as free as possible from borer attack seems to be fully justified by these investigations."

Sugarcane borer effect upon value of seed cane.—A preliminary report, W. E. HINDS and B. A. OSTERBERGER (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 972, 973*).—In six variety tests of cane at the Louisiana Experiment Stations in

1931–32, the loss in yield, as computed from the plat to the per acre basis, ranged up to 8.5 tons per acre with the most susceptible variety. "The more vigorous-growing types of cane suffered less than those of medium vigorous growth, but in all groups it is very evident that the increase of borer infestation in seed cane produces an important loss in following yields. The average loss in three varieties of medium vigorous growth was 17.5 percent, or over 4 tons per acre. With the three varieties of more vigorous growth, the loss amounted to practically 2.5 tons, or an average of 7.1 percent of the yield secured in the borer-free plats of the same varieties."

Results on stem borer experiments in Krian during the 1931–1932 padi season, compiled by G. H. Corbett (*Malayan Agr. Jour., 21 (1933), No. 8, pp. 362–378, figs. 2*).—The experiments here reported, based on records obtained by H. T. Pagden, have shown the study of stem borers to be attended with numerous difficulties, and that considerably more work is necessary before efficient measures for their control can be recommended.

Controlling the rice borer by regulating the sowing period in West-Brebes (Residency Pekalongan) [trans. title], D. J. A. Middelburg (*Landbouw [Buitenzorg], 8 (1933), No. 9, pp. 608–636, fig. 1; Eng. abs., pp. 634–636*).—This account relates to the white rice borer *Scirpophaga innotata* Walk., which occurs exclusively in the drier lowlands. It differs from caterpillars of other rice borers of tropical regions particularly by the fact that under certain circumstances the almost adult caterpillar passes through a prolonged period of rest prior to pursuing its further development through the pupa to the moth stage. This period of latency occurs exclusively in those caterpillars that develop in ripening rice stalks, and because the rice usually ripens toward the inception of the dry period this latency is frequently referred to as the "drought sleep." It lasts at least 4½ months and is passed by the borer caterpillars within the stubbles that, after harvesting, remain on the rice fields while they are lying fallow during the east monsoon.

In work in 1931 and 1932 the pest was quite satisfactorily controlled by regulating the sowing period.

Factors influencing the activities of the cotton bollworm moth (Heliothis obsoleta Fab.), J. C. Gaines (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 957–962, figs. 6*).—Continued observations at the Texas Experiment Station on the activities of the bollworm (E.S.R., 68, p. 221) show that the growth of the cotton as indicated by the plant height and fruiting is a factor that influences the moth and egg population. The migratory habits, time of flight, and proportion of sexes are considered.

The survival of European corn-borer larvae in barns and other storage places, L. B. Scott and L. H. Patch (*U.S. Dept. Agr. Circ. 281 (1933), pp. 7*).—Investigations were conducted at Silver Creek, N.Y., by Scott and at Sandusky, Ohio, by Patch to determine if European corn borer larvae are able to survive the winter in various types of buildings used for storage of dry cornstalks. Practically no difference was noted in the percentage of moth emergence from the stalks stored in late fall, early winter, and early March, except in the case of those in the cold and dry room. About 50 percent of the moths emerging from the stalks stored on the earthen floor of the barn and 94 percent of the moths emerging from the stalks stored in the open shed emerged before August 15, and would probably have given rise to another generation of borers.

The results obtained show that the importance of stored stalks as a source of borer reinfestation depends upon the quantity of moisture reaching the infested stalks. "About 97 percent of the borers in the stalks and stubble in the fields emerged as moths during the period of the experiment, representing a normal emergence. The fact that the percentage of emergence increased from 7.3, when the stalks were in a dry barn loft, to 40 when the stalks were subjected to the damp air emanating from the earthen floor of a barn, shows the great effect moisture has upon the emergence of the moths.

"The information obtained from these investigations showed very clearly that infested cornstalks should be removed, prior to the beginning of moth emergence, from all types of shelters except those in which temperature and moisture conditions are similar to those obtaining in the loft of a very dry barn. In view of the comparatively small number of moths that emerged from the material stored in the dry barn, the authors do not feel justified in recommending that all infested material be removed from such buildings and destroyed, but it is very strongly recommended that infested material which originally contained heavy infestations be removed and destroyed prior to May 15."

Experiments in the control of the corn earworm, Heliothis obsoleta (Fabr.), with Trichogramma minutum Riley, R. K. Fletcher (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 978–982*).—Two experiments conducted at the Texas Experiment Station to control the corn ear worm by the egg parasite *T. minutum* are described, together with observations of the dispersal of the parasite in cornfields. In the work which was conducted with the Louisiana strain of the parasite it was found that the release on sugar land at the rate of 2,000 parasites per acre May 23, 2,000 on May 27, 2,000 on June 3, 4,000 on June 27, 4,000 on June 30, and 2,000 on July 8 was insufficient to give control of the corn ear worm.

On the scientific name of the webbing clothes moth, G. W. Herrick and G. H. Griswold (*Science, 77 (1933), No. 1999, pp. 391, 392*).—The authors find that the word "bisselliella" is derived from the Latin word bisellium, which was misspelled by the author by including the second "s" but must stand according to the rules of priority, it having been so published in the original description.

New Jersey Mosquito Extermination Association, twentieth annual meeting (*N.J. Mosquito Extermin. Assoc. Proc., 20 (1933), pp. 115+[2], pls. 2*).—This report of the annual meeting (E.S.R., 68, p. 788) includes the following contributions: Mosquitoes, Then and Now—Their Prevalence and Effect on Industrial and Urban Development in Hudson County, by T. M. Donnelly (pp. 10, 11); Mosquitoes, Then and Now—Prevalence and Effect on Seashore Business and Real Estate, by R. F. Engle (pp. 12–23); The Status of Mosquito Control in the Public Mind, by S. D. Walker (pp. 24–28); The Problem of Mosquito Control in Delaware, by L. A. Stearns, D. MacCreary, and N. P. Newhouse (pp. 28–32); Summary of 1932 Mosquito Work in New Jersey, by T. J. Headlee (pp. 33–59); Mosquitoes, Then and Now—Their Prevalence and Effect on Industrial, Urban, and Suburban Development in Essex County, by E. W. Jackson (pp. 59–62); Some Accomplishments in Mosquito Work Throughout the World during 1932, by F. C. Bishopp (pp. 63–90); The Need for Cooperation in Mosquito Work, by H. E. Marsh (pp. 90–92); Mosquito Suppression Work in Canada in 1932, by A. Gibson (pp. 92–101); New Developments in Mosquito Work in Connecticut—I, New Ditching and Maintenance, by R. C. Botsford (pp. 102–104); The Economic Value of Mosquito Work on Long Island, by A. D. Jaques (pp. 105, 106); and The Economic Value of Mosquito Work in Greater New York, by T. E. Freston (pp. 107, 108).

The use of blowfly larvae in the treatment of infected wounds, W. Robinson (*Ann. Ent. Soc. Amer., 26 (1933), No. 2, pp. 270–276*).—A further contribution on this subject (E.S.R., 69, p. 83).

The photoreceptive organs of a flesh fly larva, Lucilia sericata (Meigen): An experimental and anatomical study, J. K. Ellsworth (*Ann. Ent. Soc. Amer., 26 (1933), No. 2, pp. 203–215, pl. 1, fig. 1*).—The results of a physioanatomical study are here reported. The author describes the larvae of the greenbottle fly *L. sericata* as possessed of two pairs of highly specialized photoreceptive organs, contained within the bilobed maxillae, which are capable of extension and retraction. The larvae are extremely reactive to light, responding negatively.

Observations on the thermal death points of Anastrepha ludens (Loew), H. H. Darby and E. M. Kapp (*U. S. Dept. Agr., Tech. Bul. 400 (1933), pp. 19, figs. 10*).—The several stages of the orange maggot, except the egg, were studied by the authors in relation to their reactions to high and low temperatures, the lethal temperatures of the various stages being determined together with the limits of tolerance. Definite variations of response were shown to depend upon the age of this dipteran. Some further applications of these findings to the sterilization of vegetable products are suggested.

A fly pest of timothy grass, L. A. L. King (*Nature [London], 131 (1933), No. 3319, p. 837*).—Reference is made to observations of *Amaurosoma armillatum* Zett. and its injury to timothy in the neighborhood of Stirling, Scotland.

Studies of the life history and control of the spinach leaf miner (Pegomyia hyoscyami Panz.), I–III [trans. title], D. Hille Ris Lambers (*Meded. Inst. Suikerbieten., 1 (1931), No. 4, pp. 105–128; 2 (1932), No. 4, pp. 163–214+[3], pls. 9, fig. 1, Eng. abs., pp. [3]; 3 (1933), No. 3, pp. 111–120+[2], pls. 5, Eng. abs. pp. [2]*).—A report of studies of the biology, natural enemies, and control of the spinach leaf miner, referred to as the beet fly.

Notes on fleas of rats and other hosts in Kenya, C. B. Symes and G. H. E. Hopkins (*Kenya Med. Dept., Rec. Med. Res. Lab., No. 1 (1932), pp. 57, pl. 1.*)—A report is made of the results of rat and flea surveys in various districts.

Fluctuations appeared to occur in the numbers of certain flea species over long periods. Thus, in Mombasa up to 1927 the oriental rat flea appeared to be much more numerous than *Xenopsylla brasiliensis* Baker, while in 1928 the latter was more than twice as numerous as the former. A similar change has occurred in Machakos. The oriental rat flea was the predominant flea of *Rattus rattus* in Nairobi and Nakuru district, whereas *X. brasiliensis* was the prevalent species in Kisumu and Kisii and South Kavirondo. The oriental rat flea was common on field rats (particularly on *Arvicanthis abyssinicus*) in the Nakuru farming district, while *X. brasiliensis* was very scarce. Mombasa is probably climatically suitable for the oriental rat flea borne plague in nearly all months of the year, Machakos and Nairobi only during January to March or April. There is circumstantial evidence associating *X. brasiliensis* with plague outbreaks in Mombasa and South Kavirondo, and suspicion is cast upon the field rat *A. abyssinicus* in the Nakuru district.

Notes on rats, fleas, and plague in Kenya, II, C. B. Symes (*Kenya Med. Dept., Rec. Med. Res. Lab., No. 3 (1932), pp. 28, figs. 3*).—This is a report of biological and disease-transmission studies conducted in continuation of the work above noted.

The suslik fleas as reservoirs of plague virus during winter [trans. title], V. E. (V.) Evseeva and I. P. (I.) Firsov (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.), 11 (1932), No. 4, pp. 281–283; Eng. abs., p. 283*).—The experiments reported confirm the suggestion that the fleas of the ground squirrel may preserve the plague infection during a nonepizootic period and carry the disease over from one epidemic period to another.

Contact sprays for the Japanese beetle, W. E. Fleming (*U.S. Dept. Agr. Circ. 280* (*1933*), *pp. 4*).—The work with contact sprays that has been conducted over a period of several years by investigators at the U.S.D.A. Japanese Beetle Laboratory at Moorestown, N.J., and reported upon in a number of publications has been digested and is presented in this practical account. The details of the preparation and the application of the protective sprays have been given in Circular 237 (E.S.R., 68, p. 72). The formulas and directions are given for the preparation and application of two pyrethrum sprays that have given the most satisfactory results.

Sugarcane beetle injury to greenhouse roses, C. Lyle (*Jour. Econ. Ent.*, *26* (*1933*), *No. 5, p. 973*).—Serious injury caused by the sugarcane beetle to greenhouse roses, as observed at Columbus, Miss., the first week in September, is noted. About 67 percent of some 12,000 roses in the greenhouse were attacked. All of the injury was of the same type, the bark having been gnawed just below the soil surface and some plants being almost cut in two. When the injury was noticed calluses were already forming, and many of the plants eventually recovered.

Progress report on the development of the boll weevil on plants other than cotton, R. C. Gaines (*Jour. Econ. Ent.*, *26* (*1933*), *No. 5, pp. 940–943, pl. 1*).—In the studies reported, boll weevils developed to sexual maturity on cultivated althea (*Hibiscus syriacus*) and deposited eggs normally in the buds of this plant. "Three female weevils developed in, and emerged from, buds of althea. Boll weevil eggs, some of which hatched, were deposited externally on the seed pods of *H. militaris* Cav. and *H. lasiocarpus* Cav. Larvae that hatched from eggs deposited externally were placed in seed pods of these plants but soon died, leaving no evidence of feeding. No eggs were deposited on hollyhock (*Althaea rosea* Cav.) or okra (*H. esculentus* L.)."

Immature stages of Indian Coleoptera (12, 13), J. C. M. Gardner (*Indian Forest Rec.*, *17* (*1933*), *No. 8, pp. 12, pls. 2; 18* (*1933*), *No. 9, pp. 19, pls. 4*).—This is a continuation of the contributions previously noted (E.S.R., 68, p. 792). Part 12 is a continuation of the Carabidae (E.S.R., 67, p. 580), and part 13 deals with the Bostrychidae.

Influence of gregarines on growth in the mealworm, R. Sumner (*Science*, *78* (*1933*), *No. 2015, p. 125*).—The author concludes that the presence of gregarines in the intestinal tract of yellow meal worm larvae is essential for growth. It has not been determined whether or not the parasites have a part in the digestive process.

Observations on the flight and length of life of drone bees, D. E. Howell and R. L. Usinger (*Ann. Ent. Soc. Amer.*, *26* (*1933*), *No. 2, pp. 239–246, figs. 3*).—Accumulated evidence indicates that drone bees take their first flight between 4 and 8 days after emergence (with more favoring the latter figure), that they average three flights per day on sunny days and one flight per day on cloudy days, that the average duration of their flight is approximately 27 minutes, that they live approximately 54 days, and that they fly in abundance between the hours of 2 and 4:30 p.m., with their greatest peak at 4 p.m.

Unusual variation in the life cycle of the male of Aenoplex carpocapsae Cush., codling moth parasite, H. E. McClure (*Ann. Ent. Soc. Amer.*, *26* (*1933*), *No. 2, pp. 345–347, fig. 1*).—The author reports that 13 percent of the *A. carpocapsae* parasites observed had long life cycles and 47 percent the short life cycle, a 40 percent mortality being sustained. In the various stages the 13 percent predominated with a longer endurance, particularly in the resting stage. It is pointed out that this variation of life cycle within a species when the rearing was done under controlled conditions is not accountable for by any external factors, but may be an inherent factor which tends to produce males over a long period, insuring the presence of males at the time of the females.

Studies on parasites of the oriental fruit moth.—I, Trichogramma, J. C. SCHREAD and P. GARMAN (*Connecticut State Sta. Bul. 353 (1933), pp. 687–756, figs. 9*).—The first part of this work is devoted to an account of the Angoumois grain moth as a host for breeding the *Trichogramma* parasite (pp. 692–708). Studies of *Trichogramma* egg parasites, next considered (pp. 709–745), are followed by an account of field studies (pp. 745–754) and a bibliography of 31 titles.

In the rearing of the Angoumois grain moth, red winter wheat was found to be satisfactory, breeding being carried on at about 80° F. and 70 percent relative humidity. Temperatures above 85° were not desirable in cages producing the moths.

The habits and life history of the *Trichogramma* parasite were studied and many hosts found to be parasitized by it. The two common forms referred to as the "yellow" and "dark", described by C. V. Riley as *T. pretiosa* and *T. minutum*, although identical in structure, are shown by crossbreeding experiments to be sufficiently distinctive to warrant retention of Riley's original names. The yellow species, which has been most commonly encountered in New England, is regarded as *T. pretiosa*.

The adults were found to live from 5 to 119 days in the insectary. The maximum number of generations was 15. They were successfully wintered in grain moth eggs from November 6 to April 3. Polyembryony has not been observed. Unfertilized females deposit eggs that produce only males. Refrigeration has been observed to affect the sex ratio, particularly of the generation following refrigeration. Experiments indicate that 46° to 47° is best for keeping parasitized material in grain moth eggs. *Trichogramma* apparently lived better in grain moth than in oriental fruit moth eggs at 45° to 46°, but survived better in fruit moth eggs at 37°. Wing deformity is dependent on the length of refrigeration. Rate of increase is dependent on sex ratio and methods of handling, such as position of egg cards, light, etc. One female is capable of laying 18 to 29 eggs under favorable conditions. Temperature, moisture, and light requirements are described, and methods of handling the parasites are given. Annual production in the laboratory varied fom 6,000,000 in 1930 to 18,000,000 *Trichogramma* in 1932.

"The average percentage parasitism in 1931 in three orchards where no *Trichogramma* were liberated was 23; in those orchards where they were liberated it was 45 percent. *Trichogramma* liberated in quantities at a single point dispersed over an area of 32,400 sq. ft. They were proved capable of direct flight by laboratory experiments. Sulfur affects the amount of parasitism if applied at the time of liberation. In laboratory tests it reduced the parasitism about 50 percent. Talc dust was more injurious than sulfur, sulfur-lime-lead arsenate dust, lime dust, or lime-oil-lead arsenate dust. Field experiments indicated that liberations of *Trichogramma* raised parasitism and kept it about 50 percent, even though frequent sulfur applications were made. It is believed that an interval of a week or 10 days between spray application and parasite liberation will reduce the injurious effect of sulfur to a minimum. Observations and field counts indicated that high *Trichogramma* parasitism was correlated with reduced infestation, but the reduction was not enough in some cases to be called commercial control."

Trichogramma helping in control of soybean caterpillars, W. E. HINDS (*Sugar Bul., 11 (1933), No. 23, p. 3*).—Observations made of parasitism of the eggs of the velvetbean caterpillar during August and September by the Louisiana Experiment Station, briefly referred to, indicate that such parasitism by

T. minutum may occur as readily as in the eggs of the sugarcane borer or the cotton leaf worm. Even without special colonization the parasite is doing much good in checking this pest.

Larval parasites of the oriental fruit moth in Roane County, Tennessee, H. G. BUTLER (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 982–987*).—In work with larval parasites of the oriental fruit moth, 17 species have been reared by the author from twig-infesting larvae in Roane County, Tenn. "Only one of these, *Macrocentrus delicatus* Cress., is, however, sufficiently abundant to be of importance as a control factor. Over 95 percent of the parasites reared in this investigation have been of this species. While 27 colonies, including 6 species, of oriental fruit moth parasites have been liberated in the past three years, none of these species have been recovered in sufficient numbers to indicate that they are effective in this district."

A method of avoiding the destruction of Trichogramma in sugarcane fields, T. E. HOLLOWAY (*Jour. Econ. Ent., 26 (1933), No. 5, pp. 974–977*).—In this contribution attention is called to experiments started some 20 years ago on the conservation of sugarcane "trash" as a method of avoiding the destruction of *T. minutum* Riley.

Notes on the genus Aneristus Howard, with descriptions of new species (Hymenoptera: Chalcidoidea), H. L. DOZIER (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 2, pp. 93–102, pls. 2, figs. 3*).—Contributing from the Puerto Rico Insular Experiment Station on the chalcid genus *Aneristus*, all parasites on soft-scale insects, three species are described as new and notes are presented on three others, together with a key for the separation of the females and a table of the recorded species of the genus and their known hosts.

The application of artificially prolonged hibernation of parasites to liberation technique, W. A. BAKER and K. D. ARBUTHNOT (*Ann. Ent. Soc. Amer., 26 (1933), No. 2, pp. 297–302*).—The authors found that overwintering cocoons of *Microgaster tibialis* Nees and *Eulimneria crassifemur* Thoms., parasites of the European corn borer imported from France to the North Central States, when exposed to natural conditions, yield adults for liberation purposes at approximately the middle of May, i.e., two months before their host is available for parasitization in the field. Parasite colonies of these species liberated in the field two months before their host is present in stages suitable for their attack have shown no satisfactory evidence of initial establishment. Cold storage has been successfully utilized to prolong the hibernating period of these parasites, thereby making adults available for liberation in July when their host is present in the field in stages which they attack. Colonies of *M. tibialis* liberated at this later period have shown initial establishment, except in a few instances. Although results to date are not encouraging, future liberations of colonies of *E. crassifemur* will be made at this later date. It may be possible to adjust the technic of liberation to meet the needs of this parasite.

Descriptions of new mymarid egg parasites from Haiti and Puerto Rico, H. L. DOZIER (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 2, pp. 81–91*).—In this constribution from the Puerto Rico Insular Experiment Station descriptions of 12 new species of mymarid egg parasites are given, together with some rearing records from definite hosts. It is pointed out that the determination of *Anagrus flaveolus* Waterh. as a parasite of the sugarcane hopper *Saccharosydne saccharivora* Westw. is of importance since it was previously determined in Haiti and Puerto Rico as *A. armatus* Ashm.

Two important West Indian seed-infesting chalcid wasps, H. L. DOZIER (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 2, pp. 103–112, figs. 5*).—In this contribution from the Puerto Rico Insular Experiment Station, notes are presented on two seed-infesting chalcid wasps, namely, *Tanaostigma haematoxyli* n.sp., known as the logwood, or campeachy seed chalcid, and *Bephrata cubensis* Ashm., which attacks *Annona* seeds, together with technical descriptions.

The action of the parasites and hyperparasites of Hyponomeuta malinellus Zell. [trans. title], P. Voukassovitch (*Rev. Zool. Agr. et Appl., 32 (1933), Nos. 2, pp. 29–43, figs. 5; 3, pp. 51–60, figs. 4; 4, pp. 67–74*).—The details of this contribution to a study of the parasites of the ermine moth and their hyperparasites are presented in chart and tabular form. A bibliography of four pages is included.

Investigations of the mechanism of the transmission of plant viruses by insect vectors, I, H. H. Storey (*Roy. Soc. [London], Proc., Ser. B, 113 (1933), No. B 784, pp. 463–485, pl. 1, fig. 1*).—This contribution deals primarily with experiments in the mechanical inoculation of insects with plant viruses. The inoculation of active races of *Cicadulina mbila* Naude, the vector of streak disease of maize, was successful when the inoculum introduced was the juice of diseased maize seedlings, fresh or kept for four but less than eight days, undiluted or diluted with distilled water by 10^{-2} (rarely by 10^{-3}). *C. mbila* was not successfully inoculated with the viruses of maize stripe and mosaic diseases; nor *Peregrinus maidis* and the corn leaf aphid with the virus of streak.

It is concluded from these observations that in active *C. mbila* the streak virus, entering the intestine by mouth, passes through the intestinal wall into the blood, and that in the inactive insect the cells of the intestinal wall resist the passage of the virus.

The occurrence of Ixodes auritulus Neum. in North America (Oregon), C. B. Philip (*Science, 78 (1933), No. 2016, pp. 145, 146*).—This tick, known only from Estrecho de Magallanes (Strait of Magellan), South America, is recorded by the author as having been collected near Hebo, Oreg., in August 1932, a single engorged female having been taken from an English sparrow.

The role of ticks in the transmission and preservation of plague virus.—I, Experimental infection of Argas persicus with plague [trans. title], T. D. (T.) Faddeeva (*Vest. Mikrobiol., Ėpidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.), 11 (1932), No. 4, pp. 273–279; Eng. abs., p. 279*).—The experiments conducted indicate that the fowl tick may be infected with the plague virus and harbor the infection for 110 days and possibly longer. Of 49 ticks fed on the infected guinea pigs, 23.6 percent proved to be infected. Even when the infecting feed took place 18 hours before the death of the guinea pig (at which time the degree of bacteremia is very slight), 12.5 percent of the ticks were found to be plague infected.

Vicarious tick carriers of the Rocky Mountain spotted fever virus [trans. title], E. Brumpt (*Compt. Rend. Soc. Biol. [Paris], 113 (1933), No. 28, pp. 1362–1366*).—After reviewing the status of knowledge of tick transmitters of the virus of Rocky Mountain spotted fever, experiments with additional tick species are reported. It appears that most of the ticks that have been tested may carry the infection.

A study of sporadic recurrent fever in the United States transmitted in nature by Ornithodorus turicata [trans. title], E. Brumpt (*Compt. Rend. Soc. Biol. [Paris], 113 (1933), No. 28, pp. 1366–1369*).—A report on the tick transmission of recurrent fever, which occurs in Texas.

A study of Spirochaeta turicatae n.sp., agent of sporadic recurrent fever of the United States transmitted by Ornithodorus turicata [trans. title], E. Brumpt (*Compt. Rend. Soc. Biol. [Paris], 113 (1933), No. 28, pp. 1369–1372*).—The author concludes that the tick-transmitted spirochete of recurrent fever of man in Texas and probably in California represents a form different from *S. duttoni*, *S. venezuelense* (=*S. neotropicalis*), and *S. hispanicum*, which he describes as *S. turicatae* n.sp.

ANIMAL PRODUCTION

[Investigations with livestock in Kentucky] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 19, 20, 27–32*).—Data are reported on a test to determine the efficiency and economy of feeding middlings in the form of a thin slop or dry in self feeders for fattening hogs.

In poultry studies information was obtained on the development of the turkey embryo, the iron and copper content of egg yolk, vitamin D supplements for laying hens, confinement v. colony brooding, selective flock breeding, effects of outcrossing on egg production, and method of feeding grain to laying pullets.

[Experiments with livestock in Missouri] (*Missouri Sta. Bul. 328 (1933), pp. 9–13, 31, 33, 34, fig. 1*).—With beef cattle results are reported on tests with protein supplements for yearling steers full-fed on bluegrass pasture, and processing corn and alfalfa roughages for wintering stock calves, by E .A. Trowbridge and H. C. Moffett; handling and feeding native spring calves, and self-feeding native fall calves, by Trowbridge, Moffett, and M. W. Hazen; cost of processing roughages, by Trowbridge, Moffett, and D. D. Smith; and systems of grazing bluegrass pastures, by J. E. Comfort and E. M. Brown.

The hog tests report information on Sudan grass and other feeds for fattening hogs, rations for weanling pigs, and wheat for fattening swine, all by L. A. Weaver; and rations for sows during the reproductive cycle, by A. G. Hogan and S. R. Johnson.

Experiments with poultry yielded data on soluble vitamin supplements for the chick, by Hogan and R. V. Boucher; normal growth of White Leghorn, Rhode Island Red, and White Plymouth Rock pullets, artificial lights and winter egg production, and meat scrap and milk in rations for baby chicks, by H. L. Kempster and E. M. Funk; the relation of date of sexual maturity to egg production, feed purchasing power of eggs laid by a hen, and time of hatching in relation to egg production, by Kempster; commercial fattening of poultry, by Kempster, Funk, and C. G. Bryan; influence of position in the egg cycle on size of eggs, the relation of egg production to hatchability, and effect of breed and age upon hatchability of hens' eggs, by Funk.

Information was also obtained in a study of growth of draft colts on liberal and restricted grain feeding, by Trowbridge, D. W. Chittenden, and S. Brody.

[Livestock investigations in Tennessee], M. Jacob (*Tennessee Sta. Rpt. 1932, pp. 20–23*).—Information obtained in tests at Knoxville and at the West Tennessee Substation with beef cattle is reported on the feeding value of molasses as compared with ground shelled corn, and the maximum amount of grain necessary to feed 2-year-old steers to produce the most economical gains and the necessary finish for local markets, and the cost of production of beef cattle at the Middle Tennessee Substation.

In the lamb studies results are reported of the value of supplemental feeds for early spring lambs finished on pasture, a comparison of several purebred breeds of sheep, and the influence on growth, fleece, and maturity of breeding early v. late ewe lambs.

The pig studies consisted of a comparison of the cost and rate of gain when pigs were grazed on alfalfa, soybeans, and Sudan grass at the Knoxville station, and on bluegrass, Sudan grass, lespedeza, and sweetclover at the Middle Tennessee Substation.

[Livestock investigations in Texas] (*Texas Sta. Rpt. 1932, pp. 14, 15, 22, 23, 24–28, 29–31, 89–91, 94–96, 121, 162–164, 170, 171, 173, 191, 194–196*).—Data obtained in studies with beef cattle are reported for a comparison of sorghum roughages and wheat hay, and cottonseed and cottonseed meal in rations for fattening steers, by J. M. Jones, R. E. Dickson, W. H. Black, and J. H. Jones; the preparation of milo grain for fattening baby beeves, by J. M. Jones, F. E. Keating, Black, and J. H. Jones; feeding baby beeves on ground hegari heads, ground hegari stover, and cottonseed meal, and limestone flour in a grain sorghum fattening ration, by J. M. Jones, R. A. Hall, Black, and J. H. Jones; full- v. limited-feeding of grain, and influence of cottonseed in limited rations for fattening steers, by J. M. Jones, J. J. Bayles, Black, and J. H. Jones; cottonseed as a protein supplement for fattening steers, by J. H. Knox; creep-feeding range calves during the suckling period and during an 86-day period after weaning, by J. M. Jones, Black, and J. H. Jones; the value of Sudan grass for beef cattle, by Hall; chopping bundle feed, forage value of sorghum varieties, feeding cottonseed to fattening steers, and feeding wheat hay to fattening steers, all by Dickson and B. C. Langley; diversity of plants and their value for livestock, by V. L. Cory; range carrying capacity, by Cory and L. P. Gabbard; and spineless cactus for cattle, by W. H. Dameron, all at the Sonora Substation.

The tests with sheep and goats reported information on the adaptability of Corriedale sheep to southwest Texas conditions, by J. M. Jones, B. L. Warwick, Dameron, and D. A. Spencer; the relation of skin folds to weight of fleece on Rambouillet sheep, by J. M. Jones, Warwick, S. P. Davis, and Dameron; alfalfa hay v. chopped redtop fodder and redtop silage as roughages when fed with and without pulverized oyster shell for fattening lambs, by W. L. Stangel and J. M. Jones; sorghum roughages with limestone flour compared with alfalfa hay when fed with cottonseed meal and ground shelled corn or ground milo heads for fattening lambs, by A. K. Mackey and J. M. Jones; grades and shrinkage of Texas wool and mohair, by Davis and J. M. Jones; relation of age of animal to fineness of wool and mohair, by J. M. Jones, Warwick, and Dameron; pasture tests with goats, by Warwick and E. B. Reynolds; and crutching or tagging bred Rambouillet ewes, by Davis, Dameron, and J. M. Jones.

Swine studies included results on methods of feeding grain sorghums, wheat, and barley to swine, self-feeding brood sows throughout the gestation and lactation periods, studies of average daily gains and feed required per 100 lb. of gain by pigs fed in periods of wide climatic differences, and effects of rations deficient in vitamin A on eye development in pigs, all by F. Hale; fattening hogs on west Texas feeds, by D. L. Jones and Hale; and curing and storing pork products in west Texas, by D. L. Jones, Hale, and R. W. Snyder.

With poultry information was obtained in studies on the value of dried milk products for laying hens and effects of feed on leg disorders in chickens, by R. M. Sherwood and J. R. Couch; inheritance of egg production and effect of cottonseed meal on storage quality of eggs, by Sherwood; and effects of irradiations on the domestic fowl, by W. R. Horlacher and Sherwood.

Other experiments on which data are reported consisted of studies on variations in the vitamin A content of various foods and feeds, by G. S. Fraps and R. Treicher.

Corn as a silage crop, W. B. Nevens (*Illinois Sta. Circ. 409 (1933), pp. 12, figs. 2*).—This is a popular edition of Bulletin 391, previously noted (E.S.R., 69, p. 840).

The feeding of mineral supplements to livestock, H. H. Mitchell (*Illinois Sta. Circ. 411 (1933), pp. 8*).—In this publication the author points out the minerals in which farm rations may be deficient, the feeds that will supply these deficiencies, how simple mineral mixtures may be prepared, why complex mixtures are not needed, and the mineral needs of different classes of livestock.

Commercial feeds in Kentucky in 1932, J. D. TURNER, H. D. SPEARS, W. G. TERRELL, and L. V. AMBURGEY (*Kentucky Sta. Bul. 340 1933*), *pp. 83–112*).—A summary of the results of official inspection and analysis of feeding stuff samples, collected during 1932, giving the manufacturer's name, kind of feed, and number of samples equal to or below their guaranty (E.S.R., 68, p. 230). Proximate analyses of miscellaneous feed materials are also reported.

The composition of feedstuffs in relation to nutritional anemia in cattle, W. M. NEAL and R. B. BECKER (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 4, pp. 249–255*).—Samples of forages and grain were collected for analysis by the Florida Experiment Station in connection with the problem of "salt sick" (E.S.R., 66, p. 59) in order to determine the quantitative differences in the composition of samples from various areas. Proximate analyses for calcium, magnesium, phosphorus, and iron for wire grass samples collected at monthly intervals from burned and unburned areas on the range, for beggarweed, lespedeza, soybeans, alfalfa, Natal grass, corn silage, corn meal, velvetbean seed, and cottonseed meal are presented in table form.

The percentages of the above minerals in wire grass tended to decrease with advancing stages of growth, and this tendency was more marked on the burned than on the unburned areas. A similar trend was noted in the crude protein content of the grass. These differences were associated with the stage of growth and practically disappeared by midsummer. The grass from areas where animals were affected by the salt sick condition were lower in these minerals than samples from areas where the condition was not prevalent. The analyses of the other forages and grains showed the same trends. These differences confirm the results obtained in feeding iron supplements to livestock suffering from this type of nutritional disorder.

Beef cattle investigations, 1932–33 (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1932–33, pp. 8*).—The results of three tests, some of which have been continued (E.S.R., 68, p. 231), are noted.

Cottonseed cake v. grain as supplemental feeds.—In this test the five lots of cattle used in the previous work and which had been pastured together during the summer were fed for 155 days. Each yearling received approximately 53 lb. of Atlas sorgo silage per head daily and the same amount of cottonseed cake, ground kafir, ground milo, ground barley, and ground wheat as they had received the previous winter. As yearlings the gain per ton of Atlas silage fed was 53.5, 40.8, 37.1, 48.3, and 53.5 lb., and the gain per acre of silage consumed was 444.1, 338.6, 307.9, 400.9, and 444.1 lb. in the respective lots. During this feeding period 1 lb. of cottonseed cake proved to be worth as much as 2 lb. of ground wheat, slightly more than 2 lb. of ground barley, and appreciably more than 2 lb. of ground kafir or ground milo as a supplement to silage. However, there were no ill effects from the substitution of 2 lb. of any of the grains for 1 lb. of cake.

Atlas sorgo silage and ground wheat v. kafir hay and ground wheat as winter rations for stock calves.—This test was a repetition of the previous work, using the same two lots of cattle. Both the Atlas sorgo silage and the kafir hay rations proved to be satisfactory for carrying stock cattle through the winter. The silage-fed cattle gained more during the winter but less during the summer than the hay-fed cattle. The total gain, however, was slightly in favor of the silage-fed cattle. A ton of hay produced more gain than a ton of silage, but an acre of silage produced more gain than an acre of hay. The average daily gains during the second winter were 1.4 and 1.2 lb. per head in the respective lots. The average gain per acre was 444.1 lb. in the silage-fed lot and 263.8 lb. in the hay-fed lot.

The value of monocalcium phosphate in certain cattle winter rations.—In this test four lots of 10 calves, averaging about 483 lb., were fed for 155 days. All lots received 1 lb. of cottonseed cake per head daily. In addition lots 1 and 2 received about 19 lb. of Atlas sorgo hay and lots 3 and 4 about 34 lb. of kafir silage. Lots 2 and 4 also received approximately 0.02 lb. of monocalcium phosphate per head daily. The average daily gains in the respective lots were 1.3, 1.2, 1.3, and 1.2 lb. per head. No benefits were derived from the addition of monocalcium phosphate. This was attributed to the fact that 1 lb. of cottonseed cake, rich in phosphorus, was fed as part of the ration.

Some aspects of sheep nutrition, J. A. S. Watson, D. Skilbeck, and J. C. B. Ellis (*Agr. Prog. [Agr. Ed. Assoc., London], 10 (1933), pp. 124–138, fig. 1*).—In this paper from the University of Oxford, England, the authors discuss feeding standards for sheep. With the ordinary type of British winter ration the dry matter consumption of sheep did not ordinarily exceed from 2.6 to 2.7 lb. per 100 lb. of live weight. Bulky succulents tended to depress the appetite in terms of dry matter, and a shortage of protein had a similar effect. When a well-balanced diet consisted mostly or entirely of palatable dry feeds, the consumption of dry matter ran as high as 3 lb. or more per 100 lb. of live weight daily. While live weight increases can be fairly accurately predicted by assuming Kellner's figure for maintenance and the figure 2.3 lb. starch equivalent per 1 lb. of live weight increase, the limits within which these predictions are approximately true need further study. No evidence has been produced to show that high protein rations are associated with a high death rate. It is pointed out that rations of hay or hay plus silage and concentrates may become of greater importance than the expensive and possibly inefficient root crops.

The basal (standard) metabolism of the Australian Merino sheep, E. W. Lines and A. W. Peirce (*Aust. Council Sci. and Indus. Res. Bul. 55 (1931), pp. 34, figs. 5*).—The division of animal nutrition of the Council for Scientific and Industrial Research in Australia undertook a study of the energy expenditure of the Australian Merino sheep when fasting and at rest. The indirect method of calorimetry was used in the work.

The best relation between the surface area in square meters (A) and the live weight in kilograms after fasting 48 hours (W) for the flocks studied was given by the equations, for adults $A=0.0909\ W^{\frac{2}{3}}$, and for all ages $A=0.121\ W^{0.60}$, while poorly grown weanling ewes from another district fitted best with the equation $A=0.107\ W^{\frac{2}{3}}$.

After feeding the average metabolism was 35 percent higher than that after 48 hours' fasting. Even after 72 hours' fasting, the metabolism was significantly affected by the amount of protein in the previous ration. On poor autumn feed or on limited rations in dry lot the standard metabolism of ewes averaged 1,060 Calories/m^2/24 hours, and of wethers approximately 890 Calories/m^2/24 hours. After the animals had been on good pasture the metabolism rose to about 1,250 Calories/m^2/24 hours for both sexes. In the above formulas m^2 equals the surface area. Up to about three fifths of the gestation period there was no significant rise in the production of calories per square meter of surface calculated from weight.

The average standard metabolism of animals after being on good pasture in the spring was approximately 20 percent above that of similar animals after feeding on poor pasture in the autumn.

The respiratory quotients obtained in this study fell into a group with a mode of 0.73 and a mean of 0.72. Animals with a respiratory quotient of about 0.73 appeared to be oxidizing fat and protein only. No acetone was found in the urine of sheep having a low respiratory quotient after a 48-hour fast, but after a more prolonged fast 0.5 g per day was excreted.

Variation in the protein intake of sheep in relation to wool growth, A. H. H. FRASER and J. A. FRASER ROBERTS (*Jour. Agr. Sci.* [*England*], *23* (*1933*), *No. 1, pp. 97–107*).—A study was undertaken at the Rowett Research Institute, Scotland, to determine whether extra protein fed to sheep would be partially utilized as such for the production of extra wool. Rations known to produce satisfactory growth were fed to two lots of 20 sheep each kept indoors. One lot received 52 percent more digestible protein than the other. The sheep were shorn at the beginning and end of the test. The fleece and fibers from the same body area were compared after each shearing.

There was no significant difference in any of the wool characters measured between the two groups. The two groups also had the same mean increase in body weight. The high proportion of wool produced by the low-protein group indicated that synthesis of cystine occurred. It was suggested that this synthesis might be a special function of the wool follicle.

A simple apparatus for weighing sheep or lambs, D. J. SIDEY (*New Zeal. Jour. Agr.*, *44* (*1932*), *No. 3, pp. 214–217, figs. 3*).—The author describes a simple device used at the Canterbury Agricultural College, New Zealand, for weighing experimental sheep. This device has proved both satisfactory and convenient.

Methods of feeding and grain rations for fattening lambs, J. W. WILSON, T. WRIGHT, and F. U. FENN (*South Dakota Sta. Bul. 278* (*1933*), *pp. 16*).—A series of tests covering a period of three years was undertaken to determine the comparative value of rations of shelled corn and whole afalfa hay when hand-fed and when self-fed, the same comparison when both feeds were ground, and the value of adding oats or oats and linseed meal to a ration of shelled corn and whole alfalfa hay. The lambs used averaged 65 lb. initial weight and were fed for an average of 81 days.

The rate of gain was practically the same whether the lambs were hand-fed or self-fed when whole feeds were used. The average for 3 years showed that self-fed lambs required 38.4 lb. more grain and 41.5 lb. less hay per 100 lb. of gain than hand-fed lambs. When ground feeds were used the rate of gain was practically the same, but the self-fed lambs required an average of 73 lb. more grain and 15.2 lb. more hay than the hand-fed lambs. Lambs fed whole feeds made faster gains in all cases than those fed ground feeds. The 3-year average shows a saving of 34.4 lb. of grain and 42.2 lb. of hay per 100 lb. of gain in favor of whole feeds. The results also showed that a grain ration of shelled corn and whole oats equal parts produced faster gains than a ration of corn, and that the addition of linseed meal to corn and oats still further increased the rate of gain. The use of oats decreased the amount of alfalfa hay required per unit of gain. These results indicated that when only limited amounts of alfalfa hay are available it can be extended over a longer period by feeding oats.

The second part of this bulletin is devoted to a review of work previously noted (E.S.R., 15, pp. 87, 290; 16, p. 399; 23, p. 176; 25, p. 774; 29, p. 669; and 35, p. 772).

Planning for lamb-feeding, H. R. LASCELLES (*Colorado Sta. Bul. 405* (*1933*), *pp. 8, figs. 2*).—This bulletin was prepared for use as a guide to the feeder for determining the number of lambs necessary to consume the feed on hand and also as a help in selecting his most economical ration. Plans for a feeding yard and equipment are also given.

The role of vitamin D in the nutrition of the pig, R. D. SINCLAIR (*Sci. Agr.*, *13* (*1933*), *No. 8, pp. 489–504, figs. 4*).—A series of experiments was undertaken to study the various forms of irradiation on the general growth and mineral metabolism of winter pigs and to compare the results obtained with those obtained when vitamin D was fed in the form of cod-liver oil. Three of the experiments were conducted at the University of Alberta, Canada, and one each at the Rowett Research Institute, Scotland, and Cambridge University, England.

The results showed that exposure to solar or artificial irradiation as well as cod-liver oil feeding promoted growth in pigs, the response being inversely proportional to the calcium content of the ration. A condition of stiffness, clinically suggestive of rickets, was prevented or mitigated by the use of radiant energy. Adding calcium in the form of ground limestone to the basal ration was of great value in preventing the onset of stiffness, in promoting growth, and in reducing the feed required per unit of gain. It also resulted in an increase in the ash content of the bone.

The rachitic symptoms were characterized by a lowering in the blood calcium level without any consistent change in the organic phosphorus. The addition of ground limestone to the basal ration increased the serum calcium content. The antirachitic factor, whether ingested or synthesized in the body, raised the calcium level of the blood and increased the calcium-phosphorous product.

Changes in quantity and composition of fat in hogs fed a peanut ration followed by a corn ration, N. R. Ellis (*U.S. Dept. Agr., Tech. Bul. 368 (1933), pp. 14, figs. 2*).—This study was undertaken by the animal husbandry division of the Bureau of Animal Industry to determine the underlying factors involved in fat deposition in the hog when both hardening and softening feeds were fed. Two lots of pigs, averaging approximately 100 and 40 lb. initial weight per pig, respectively, were used in the test. The first group received the softening ration of whole peanuts and a mineral mixture, and the second group received tankage, whole peanuts, and a mineral mixture. After the pigs in the respective lots had gained from 50 to 60 lb. and from 40 to 50 lb. per head, a hardening ration of yellow shelled corn, tankage, and a mineral mixture was fed. Pigs were killed for analyses at the beginning of the test, at the end of the peanut-feeding period, and after they had made gains on the hardening ration of approximately 2, 2.5, 3, 3.5, 4, and 5 times their gains on peanuts.

The analyses of the carcasses showed a higher rate of fat storage during the peanut period than during the corn period. The heavier group stored oily fat at a slightly higher rate than the lighter group. As the length of the corn-feeding period progressed, the firmness of the carcasses increased. The gain in total fat was generally more closely related to firmness than the gain in live weight. At the same gain ratio, greater firmness was produced in the hogs in the lower weight group. The fat samples showed marked decreases in saturation due to peanut feeding and an increase in saturation due to corn feeding. The addition of hard fat to the oily fat already formed produced a gradual hardening of the body fat as a whole. The saturated acids replaced linoleic as second to oleic when corn was substituted for peanuts.

Influence of rape oil on the iodine index of pig's fat [trans. title], J. [E.] Bormann (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest Ann.), 30 (1933), No. 1, pp. 117–126; Eng. abs., p. 126*).—In a study at Poznań (Posen) University Zootechnical Institute, Poland, a group of four pigs was fed a basal ration of barley, rye, meat meal, and sugar beets. In addition two of the pigs received rape oil in amounts equal to twice the quantity of oil in the basal ration.

Analyses of samples of fat from different parts of the body showed that the addition of rape oil increased the iodine number of the fat. The greatest increase occurred in the back fat, followed in descending order by samples from the underside, leaf, kidney, muscular, and heart fat. The increase amounted to approximately 10 percent in the case of the samples of back, underside, and leaf fat.

The evolution of the endurance, speed and staying power of the racehorse, W. J. S. McKay (*New York: Charles Scribner's Sons, 1933, pp. 318, [pls. 15, fig. 1]*).—This treatise deals with the history of the evolution of the Thoroughbred horse and discusses the theories relating to the effect of racing on the physical characters of the horse. The appendixes explain some essential points about the heart and respiration of the horse which form the basis for the "heart theory of staying power", on which the author explains the success of race horses.

The significance of length of biological laying year in production breeding, F. A. Hays and R. Sanborn (*Massachusetts Sta. Bul. 298 (1933), pp. 11, figs. 2*).—These studies were made to determine whether birds that continued to lay without interruption for 13, 14, or 15 months were superior for breeding purposes to birds laying for from 9 to 12 months before molting. The biological year considered in this study is defined as that period from first pullet egg to a 30-day cessation after March 1, or if no such pause occurs after a 365-day production period the onset of a pause of 8 days or more is taken. The data were collected on 911 Rhode Island Red females of 12 generations that were trap-nested for two full laying years and on a total of 2,311 of their daughters, representing 12 generations.

It was found that the duration of the biological year was closely associated with early sexual maturity, but there was no significant relation between length of winter pause and length of biological year. There was a small but significantly positive correlation between length of biological year and large winter clutch size or high intensity. The degree of broodiness gave a negative correlation with length of biological year. There was an intimate correlation between annual persistency and annual egg record and between annual egg record and length of biological year. The hatchability during the first and second year was independent of length of biological year. Small body weight at first egg and heavy body weight at the close of the 365-day laying year were associated with great length of the biological year. The second year egg production tended to be higher in birds having a biological laying year greater than 365 days. Daughters from dams with a biological year greater than 365 days had a higher annual persistency than daughters from dams with a biological year of from 315 to 365 days or from dams with a biological year shorter than 315 days. The same was true in regard to annual egg records of daughters. Great length of biological year in dams indicated superior vigor as measured by the lower mortality rate for their daughters in the laying house. The selection of females having the ability to lay continuously for more than 365 days was a good practice for breeding purposes.

Significance of short-time egg yield records, W. C. Thompson (*Poultry Sci., 12 (1933), No. 3, pp. 179–183*).—The trap nest records of the Passaic County and Vineland egg-laying contests were analyzed at the New Jersey Experiment Stations to determine whether any short-time-period egg yield record could be used as a criteria of selection.

The results indicated that the correlation between egg yield during the first 4 months (winter period) and annual total egg production was definitely positive, quite significant, and reasonably reliable as an index of annual production. The standard error of estimate for this record was large enough to show that it was not accurate enough to define annual egg production total. However, since the record was made just after pullets reached sexual maturity and were in strong physical condition it may be more accurate than either the coefficient of correlation or the regression equation indicated.

It was suggested that on the basis of these records pullets may be divided into three groups: (1) Those producing between 40 and 60 eggs during the winter may be expected under normal conditions to have an annual production of between 175 and 205 eggs, (2) those laying between 60 and 80 eggs, an expected production of 205 to 235 eggs, and (3) those producing more than 80 eggs, an expected production of more than 235 eggs.

It was also suggested that if pullets on which trap nest records were kept during the winter period were again trap-nested in 30 days, beginning about August 25, a still more efficient criterion of selection would be established. The correlation between egg yield for the months of December and January and annual total egg production was scarcely of significant value. A correlation of 0.8103±0.0068 was found between the percentage of first-grade eggs produced during January and the percentage of similar eggs laid during the year. On this basis pullets that produced less than 60 percent of first-grade eggs during January should not be used for breeding purposes when the aim is to improve egg size.

Is there an egg-laying type of the domestic fowl? M. A. Jull, J. P. Quinn, and A. B. Godfrey (*Poultry Sci., 12 (1933), No. 3, pp. 153–162*).—In an effort to determine whether there is any significant relationship between the so-called type of laying birds and their laying ability, a number of live bird measurements, carcass measurements, and bone measurements of dead birds were made by the U.S.D.A. Bureau of Animal Industry. The data were secured from flocks of White Leghorns and Rhode Island Reds.

The live bird measurements were not reliable indexes of the shape or type of bird. Such measurements as length, breadth, and depth of head, length and breadth of back, greatest width at shoulders, and depth of body in front when taken on live birds were of no value in selecting for laying ability.

The dressed carcass measurements were not highly correlated with comparable bone measurements and could not be considered reliable indexes of egg-laying ability. No significant relationship was found between length, breadth, or shape of skull and egg production, total weight of eggs laid, or mean weight of eggs. Both the simple correlation coefficients and the multiple correlation between egg production and the bone measurements, length of back, width of back from femur joint to femur joint, and length of keel, were not significant. The same was true of multiple correlations between these measurements and total egg weight or mean egg weight per bird. The evidence indicated that the type of bird, as influenced by the skeletal structure, had no significant relationship to egg-producing ability.

Effect of temperature on the growth, fat and calcium metabolism, and mortality of the chick embryo during the latter part of incubation, A. L. Romanoff and H. A. Faber (*Jour. Cell. and Compar. Physiol., 2 (1933), No. 4, pp. 457–466*).—The New York Cornell Experiment Station made a study of the influence of temperature on the developing chick embryo during the latter part of incubation. Eggs from White Leghorn hens were incubated under the usual environmental conditions up to the sixteenth day of embryonic age. After this period hatching proceeded with a relative humidity of 60±1 percent, the carbon dioxide was gradually increased to a maximum of 0.7 percent, and the temperature was varied in each test as follows: 40°, 38°, 36°, 34°, and 32° C.

At 40° the growth of the embryo was first accelerated and then completely arrested, but the life of some of the embryos was maintained up to complete hatching. At 32° growth was slightly retarded. The rate of utilization of yolk and albumin was slow at the high temperature and rapid at the low temperature, with the albumin completely disappearing at 18 days. Neither high nor low temperature had a marked influence on either fat or calcium metabolism. At the high temperature the mortality of the embryos was very heavy from the beginning to the end, but at the low temperature there was a gradual decrease in mortality. Hatching occurred one half day or so earlier at high temperature and was irregular and delayed about two days at low temperature. During the latter part of incubation a temperature of from 36° to 34° was found to be the most efficient for the growth, metabolism, survival, and natural vitality of the chick embryo.

Cane molasses in poultry rations, C. M. Bice (*Hawaii Sta. Bul. 67 (1933), pp. 16, figs. 15*).—The results of a series of tests showed that when fed in amounts not to exceed 7 percent of the mash ration cane molasses was a satisfactory feed for chicks and for growing pullets and cockerels. It did not, however, prevent coccidiosis in baby chicks. In fattening rations for broilers, feeding 5, 10, and 15 percent of molasses resulted in economical gains, but with hens in fattening batteries it was inefficient.

Fish meal suplements for chicks, I, II (*Sci. Agr., 13 (1932), No. 4, pp. 236–248, 273; Fr. abs., p. 273; 13 (1933), No. 7, pp. 435–438, 471; Fr. abs., p. 471*).—The University of British Columbia undertook a study to obtain information on various fish meals.

I. *Comparative rate of growth-to-eight-weeks on rations supplemented with pilchard, salmon, halibut, dried skim milk or with salmon meal and dried skim milk,* V. S. Asmundson and J. Biely.—A series of five experiments was conducted to show the comparative rate of growth of chicks raised to eight weeks in battery brooders on rations supplemented with various fish meals.

The average weights of chicks at eight weeks when the rations were supplemented with halibut meal, salmon meal, pilchard meal, and dried skim milk to supply 10 percent of protein were 585.6, 632, 636.9, and 648.2 g, respectively. When fed at a level of 5 percent protein, there was no difference in the growth of chicks fed salmon meal alone and those fed salmon meal and dried skim milk. At levels of 7.5 and 10 percent protein, the chicks fed the salmon and milk combination grew more rapidly than those fed salmon alone, and the difference in weight was greater at the highest protein level. These results indicated a supplementary value of the milk and salmon at the higher levels. The average weight per chick at eight weeks of age at the different levels of protein feeding was as follows: Salmon meal alone, 10 percent—558 g; 7.5 percent—558 g; and 5 percent—502 g; salmon and dried skim milk, 10 percent—676 g; 7.5 percent—619 g; and 5 percent—478 g.

II. *Comparative rate of growth-to-eight-weeks on rations supplemented with various proportions of fish meal and dried skim milk,* J. Biely and V. S. Asmundson.—Two tests including six lots of chicks each were conducted to determine the effects of various proportions of dried skim milk and fish meal on the rate of growth of chicks to eight weeks. The fish meal in the rations varied from 5.5 percent in lot 1 to 12 percent in lot 5 and the skim milk from 12.5 percent in lot 1 to 2.5 percent in lot 5. Lot 6 received 14 percent of fish meal (halibut meal in the first and pilchard meal in the second test) and no milk.

The first four lots showed no significant difference in weight up to eight weeks of age in either test. When halibut meal was fed, the chicks in lot 5 that received only 2.5 percent of milk grew more slowly than those receiving more milk, while the corresponding group when pilchard meal was fed grew as rapidly as the other lots. In neither test was the growth rate increased by feeding more than 5 percent of dried skim milk when fish meal supplied

7.5 percent or more of the protein. Again the chicks receiving fish meal and milk grew more rapidly than those receiving fish meal alone.

Fish meal supplements for chicks.—III, Comparative growth on rations with pilchard meals, W. J. Allardyce, W. Henderson, and V. S. Asmundson (*Poultry Sci., 12 (1933), No. 3, pp. 163–166*).—Continuing the above studies, four samples of pilchard meal were obtained from three reduction plants and were tested in two experiments by feeding them with a standard all-mash ration to chicks kept in battery brooders. The ash content of the meals varied from 12.8 to 15.3 percent, the protein content from 63.8 to 66.5, and the fat content from 4.7 to 7.5 percent.

The average weights at eight weeks attained by the chicks on the different meals in the two tests were: Meal 1, 551 g; meal 2, 518 g; meal 3, 624 g; and meal 4, 556 g. The chicks receiving meal 3 were significantly heavier than those receiving meal 2. The weight of the chicks varied inversely with the fat content but showed no relation to the protein or ash content of the meals. No relationship was found between the color and texture of pilchard meals and the rate of growth.

Alfalfa products as green feed substitutes for layers, B. W. Heywang (*Poultry Sci., 12 (1933), No. 3, pp. 167–172*).—This experiment at the U.S. Poultry Experiment Station, Glendale, Ariz., was undertaken to show the relative value of alfalfa products when used as the principal source of vitamin A in diets for laying birds. The data were obtained from three experiments, each lasting 365 days, in which several different alfalfa products and cod-liver oil served as supplementary sources of vitamin A in rations that were adequate except for this vitamin.

Sun-cured alfalfa meal was found to be a poor substitute for fresh alfalfa, while sun-cured alfalfa leaf meal was more satisfactory than the sun-cured alfalfa meal. Whole alfalfa hays were not reliable substitutes for fresh alfalfa. Fresh alfalfa fed ad libitum and cod-liver oil at the rate of 1.5 percent of the feed intake were superior to all the other supplements used in maintaining life.

Feeding for efficient growth and prevention of slipped tendons in chickens, R. M. Sherwood and J. R. Couch (*Texas Sta. Bul. 476 (1933), pp. 16*).—The data used in this study were obtained from 32 tests, using 20 rations, to ascertain the effect of various carbonaceous and protein feeds on the rate and economy of gains and upon the prevention of slipped tendons. The work was limited largely to six feeds, involving wheat gray shorts, rice bran, and ground oat groats, which replaced part of the yellow corn meal for the basal ration, and meat and bone scrap, cottonseed meal, and whole pressed peanut screenings, which replaced part of the dried buttermilk.

On the basal ration of yellow corn meal, dehydrated alfalfa leaf meal, dried buttermilk, ground oyster shell, bone meal, salt, and fortified cod-liver oil approximately 14 percent of the chicks developed slipped tendons. Replacing 20 percent of the corn meal with wheat gray shorts prevented the development of this condition. This ration also increased the rate and economy of gains. Using 5 or 10 percent of rice bran or 10 or 20 percent of ground oat groats to replace a like amount of corn meal decreased the number of slipped tendons and increased the rate and economy of gains. When 6 percent of meat and bone scrap or cottonseed meal replaced a like amount of dried buttermilk, the rate and economy of gains were increased. When the basal ration was modified so that 6 percent of whole pressed peanut screenings, 10 percent of wheat gray shorts, and 5 percent of rice bran replaced like amounts of dried buttermilk and corn meal, the gains were more rapid and economical than with the basal ration.

The following ration fed to chicks in battery brooders produced rapid and economical gains, and few slipped tendons occurred: Yellow corn meal 44.88 percent, dehydrated alfalfa leaf meal 5, dried buttermilk 6, cottonseed meal 6, meat and bone scrap 6, wheat gray shorts 20, rice bran 10, oyster shell 1, salt 1. and fortified cod-liver oil 0.12 percent. The rice bran may be replaced by corn meal, but whole pressed peanut screenings are not recommended for this ration.

Influence of continuous light on Leghorns, R. Penquite and R. B. Thompson (*Poultry Sci., 12 (1933), No. 3, pp. 201–205, fig. 1*).—At the Oklahoma Experiment Station yearling hens and pullets of the White Leghorn breed were exposed to continuous light during a study which lasted three years. The lights did not increase or decrease to a significant extent the total number of eggs laid. In all the lighted pens birds weighed more at the end of the experiment than at the beginning. The continuous light apparently had no deleterious effects upon the birds, and did not materially decrease the percentage of healthy chicks produced. More eggs were produced during the months of November, December, and January in the lighted pens than in the controls. The peak of production in the lighted pens was reached in November and December, while the controls reached their peak in March and April. Mortality in the lighted pens was 24, 23, and 14 percent, and in the controls 5, 34, and 24 percent, in the respective years.

Factors affecting wet litter, M. W. Miller, G. E. Bearse, and G. Cushing (*Poultry Sci., 12 (1933), No. 3, pp. 173–178, fig. 1*).—The Western Washington Experiment Station undertook a study of the effects of floor heat and ventilation on the maintenance of dry litter in poultry houses. During the entire experimental period the humidity and rate of lay were favorable for the production of wet litter. Various rates of ventilation and means of heating for the prevention or drying out of wet litter were tested.

It was found that dry litter could be maintained when all conditions were favorable for wet litter by keeping the air beneath the wooden floor at least 7.5° F. warmer than the air immediately above the floor. Wet litter could also be dried out by applying heat beneath the floor. Neither slow nor rapid ventilation maintained dry litter.

Factors affecting the keeping qualities of eggs, W. H. Dryden and R. W. Hale (*Agr. Prog. [Agr. Ed. Assoc., London], 10 (1933), pp. 92–99*).—A series of tests was undertaken at the Agricultural Research Institute of Northern Ireland to study some of the causes of poor storing qualities of eggs.

The main factor governing the keeping quality of eggs was the season of the year. Under trade conditions it was doubtful whether extremes of feeding had any effect on keeping quality. There was no appreciable difference in the keeping quality of eggs from hens confined in pens and from hens on free range. The rate of production was apparently not related to keeping quality. Eggs that were stored and left undisturbed kept better than those in transit. Eggs packed with the air cell up remained in good condition longer than those packed with the air cell down. The presence of a running or tremulous air cell when eggs were candled did not necessarily denote poor keeping quality.

Variations of serum-calcium in the rabbit, M. C. Bourne and D. A. Campbell (*Biochem. Jour., 26 (1932), No. 1, pp. 183–195, figs. 4*).—A study was undertaken at University College, London, to determine more exactly the conditions under which the serum calcium of rabbit blood was variable and to learn how the variations were related to diet.

Values in serum calcium for 18 buck rabbits varied from 12.4 to 18.6 mg per 100 cc of blood over a period of about one year. When the animals were starved for 16 hours before taking the blood samples, the range was reduced to between 12.3 and 15.8 mg. The effect of the diet was shown by the fact that two hours after feeding cabbage a maximum rise of 4.6 mg and an average increase of 1.8 mg per 100 cc occurred in the serum calcium. Oats fed to a fasting rabbit resulted in a maximum rise of 0.1 mg and an average fall of 0.62 mg per 100 cc. Simultaneous analyses of calcium and inorganic phosphorus in the serum showed that the concentrations of these constituents bore a reciprocal relation to each other. On a cabbage diet the urine of rabbits was strongly alkaline, containing large amounts of calcium but no phosphorus or only a trace. On the oats ration the urine was acid, rich in phosphorus, and contained only small amounts of calcium. The volume of urine was about ten times greater on the cabbage than on the oats diet. These results indicate that the calcium-phosphorus ratio of the diet may be of great importance in determining the blood calcium level in the rabbit.

Effects of overdosage of irradiated ergosterol in rabbits: Changes in the distribution of phosphorus in blood cells and plasma, G. M. Guest and J. Warkany (*Jour. Biol. Chem., 100 (1933), No. 2, pp. 445–454*).—The authors made a study of the distribution of phosphorus in the blood cells and plasma of rabbits before and after the administration of large amounts of irradiated ergosterol. The ergosterol was fed at the rate of about 0.8 cc of a solution 10,000 ×, either as a single dose or as repeated smaller doses. The most marked changes due to this feeding occurred in the inorganic phosphorus of the plasma and in the organic acid-soluble ester phosphorus of the cells. In the plasma there was an increase from 3.8 to 10 mg per 100 cc in inorganic phosphorus, while in the cells the ester increased from 79.7 to 101.7 mg per 100 cc. These changes occurred within 48 to 72 hours following a single large dose, but changes of equal magnitude developed more slowly when small daily doses were administered over periods up to 25 days.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Kentucky] (*Kentucky Sta. Rpt., 1932, pt. 1, pp. 34–36*).—In these investigations results were obtained on the iodine content of cows' milk under varying conditions and on the score of butter from cream graded according to the 4-day plan.

[Experiments with dairy cattle and dairy products in Missouri] (*Missouri Sta. Bul. 328 (1933), pp. 20, 21, 22*).—Studies with dairy cattle report data on the functional individuality of the mammary glands of the udder of the dairy cow, by C. W. Turner; the efficiency of the growth process at various ages under various conditions of management, fattening, milk production, etc., by S. Brody et al.; evaluating dairy sires, the effect of forced production records on the transmitting ability of dairy cows, and a study of polythelia in dairy cattle, by W. Gifford; and the effect of frequency of milking on the annual production of dairy cows, by Gifford and J. E. Crosby.

In studies with dairy products information was obtained on the relationship of the quality of raw milk to the quality of the resultant dairy products, by W. H. E. Reid and F. O. Briggson; processing skim milk powder in cottage cheese, by Reid and C. L. Fleshman; the removal of undesirable flavors from cheese, by Reid and W. E. Painter; relation of instant freezing and quick hardening to the physical properties of ice cream, sherbets, and ices of different flavors, by Reid and M. W. Hales; and the effect of the quality of the cream used in ice cream mixtures upon pasteurization efficiency, by E. R. Garrison and B. W. Hammar.

[Experiments with dairy cattle in Texas] (*Texas Sta. Rpt. 1932, pp. 92–94*).—Data obtained in experiments with dairy cattle are reported for studies on the use of cottonseed meal and hulls as a ration and ground wheat as a feed for lactating dairy cows, by O. C. Copeland, and feeding value of unground v. ground grain for dairy cows, by A. L. Darnell and Copeland.

[Experiments with dairy cattle in Vermont] (*Vermont Sta. Bul. 360 (1933), pp. 21–25*).—Information is reported from investigations on the effect of the nutritional plane on utilization of calcium and phosphorus by the dairy cow, comparative yields of grass plats as influenced by the number of cuttings; chlorine sterilization of utensils for production of high quality milk; and the relative efficacies of cocoa shells, peat moss, shavings, clapboard sawdust, and oat straw as beddings for dairy cattle.

Studies of feed value of early hay, F. S. Prince, P. T. Blood, and G. P. Percival (*New Hampshire Sta. Circ. 41 (1933), pp. 6*).—The objects of this study were to determine the relative yields of timothy hay cut at different dates, its feeding value as determined by nitrogen analyses, and its actual feeding value as determined in tests with dairy cows. Six plats of timothy hay were cut at the following stages of maturity: Heads appearing, headed, bloom appearing, past bloom, seed dough, and seed nearly ripe. The hay was dried in an electrical drier immediately after cutting at a temperature of about 165° F.

The early-cut grass hay contains a higher percentage of protein and more protein per acre than later cuttings. Grass hay, such as timothy, in order to be of the most value for dairy cows should be cut before the bloom period. On this basis, haying in the southern part of the State should start as early as June 15 and in the northern part not later than June 25. When early haying is practiced, the second crop yields are higher. Postponing harvesting from June 20 to July 20 may mean a difference of at least 50 percent in digestible proteins per acre in favor of the early-cut hay. Early-cut hay carries more water in the tissues than late-cut hay and is, therefore, more difficult to cure.

Seasonal composition of pasture grasses, R. H. Lush (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 149–152*).—Over a period of 3 years caged pasture areas at the Louisiana Experiment Stations were clipped at monthly intervals for analyses. The prevailing vegetation in early spring was White Dutch clover (*Trifolium repens*) and hop clover (principally *T. procumbens*). In May these crops were replaced with Dallis (*Paspalum dilatatum*) and Bermuda (*Cynodon dactylon*) grasses, with the white clover reappearing in the fall. Considerable ryegrass (*Lolium multiflorum*) was found in the spring and carpet grass (*Axonopus compressus*) in the summer.

The analyses showed little difference in the chemical composition of grasses from fertile pastures cut on the same date. The season of the year and the rate of growth was of more importance than the type of vegetation in determining the protein and fiber content of the grasses.

Feeding value for milk production of pasture grasses when grazed, when fed green and when fed as hay or silage, R. R. Graves, J. R. Dawson, D. V. Kopland, and T. W. Moseley (*U.S. Dept. Agr., Tech. Bul. 381 (1933), pp. 48, figs. 2*).—A study was begun in 1928 at the Huntley, Mont., Field Station to secure data on yields and feeding value for dairy cows of irrigated pasture grasses when pastured, when cut at different stages of maturity, when fed as fresh green grass, and as cured hay or silage. The results of two years' work are reported.

The cows showed a marked preference for the hay or silage made from immature grass by their greater feed consumption and milk production. The gain in milk yield and loss in body weight of one cow while on the experimental pasture and the loss in milk yield and gain in body weight while on another pasture during the same year indicated that grasses at different stages of maturity may have a very different effect on these two functions of the body. Cows consumed more dry matter in the form of hay than as silage, but the consumption of both was greatest when made from the third-cutting grass. The average daily consumption of this cutting was 50.1 lb. of hay containing 41.7 lb. of dry matter and 136.4 lb. of silage containing 34.4 lb. of dry matter. The dry matter consumed in the form of green grass was midway between these levels.

During the 1929 season the cows fed grass hay had an average milk production of 40.6 lb. per day, which was higher than that for those fed green grass or grass silage. Silage-fed cows lost weight more rapidly than hay-fed cows, but their decline in milk flow was approximately the same in 40 days as that of the hay-fed group in 20 days. There were indications that grass silage was more stimulating to milk flow than grass hay. The addition of grass silage to a grass hay ration did not increase the consumption of dry matter, but adding grass hay to a grass silage ration did increase the amount of dry matter consumed. Green grass, whether grazed or cut and fed green, was consumed in quantities sufficient for body maintenance and for a large flow of milk if the grass was available in sufficient quantities and at an immature stage. Due to the great variations in rate of growth at different seasons, it was difficult to maintain a large flow of milk over a considerable period on grass alone.

When fed to capacity, cows consumed an average of 136.6 lb. of cut green grass per head daily as compared to 75.6 lb. when fed grass cut from an area the same size as was needed to pasture an equal number of animals. In general, the yields of dry matter, protein, and percentage of protein were definitely related to the number of cuttings.

These results, together with other experimental evidence obtained by the U.S.D.A. Bureau of Dairy Industry, point toward possible changes in methods of livestock feeding. Some of these changes would include keeping most of the farm in permanent grass and legumes upon which animals would be grazed and the surplus saved in the form of hay or silage to be fed as a supplement to grazing or when grazing is impossible. Such a system would mean less cultivation of soil, conservation of soil fertility, and reduction of soil erosion.

Progress report of pasture fertilization at the Virgina Agricultural Experiment Station, C. W. HOLDAWAY and A. D. PRATT (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 95–99*).—The Virginia Experiment Station undertook a study of the fertilization of bluegrass pastures. The experimental pasture was divided into four 10-acre plats, two of which served as checks and received no fertilizer. On the other plats one ton of finely pulverized limestone per acre was applied in March, and 500 lb. of superphosphate, 160 lb. of muriate of potash, and 200 lb. of ammonium sulfate per acre were broadcast on the sod. In July another 200-lb. application of ammonium sulfate per acre was made. Both continuous and rotational grazing was practiced on the various plats. No grain was fed to the cows while on pasture.

On the fertilized plats there was an increase of 78 percent in the production of total digestible nutrients due to fertilization. The feed cost per pound of butterfat was 9.05 c. on the unfertilized plats and 18.31 c. on the fertilized plats. The feed cost per hundredweight of 4 percent milk was 28.1 c. for the unfertilized and 53.4 c. for the fertilized plats. These figures show that for the first season the cost of producing milk or fat on fertilized pastures was very near to the market value of the product. However, only a small proportion of the added fertility was removed during the season, and the increased pasturage that should follow for several years would justify the financial outlay for fertilizer.

Wheat versus milo for dairy cows, O. C. Copeland (*Texas Sta. Bul. 480 (1933), pp. 11*).—This study was designed to determine the value of coarsely ground wheat as a substitute for ground milo in rations for dairy cows. Using the double reversal method, two groups of six cows each were fed for 28-day experimental periods in three tests. Silage and alfalfa hay were fed in addition to the grain mixture, in which ground wheat or ground milo made up 50 percent.

The results showed that wheat could replace milo pound for pound when not more than 50 percent of the grain mixture was composed of wheat. There was apparently no difference in the palatability of the two rations. The productive energy of wheat, calculated from the results of this study, was 84.9 therms per 100 lb. as compared with 83.3 therms for ground milo.

Phosphorus deficiency in the rations of cattle, C. H. Eckles, T. W. Gullickson, and L. S. Palmer (*Minnesota Sta. Tech. Bul. 91 (1932), pp. 118, figs. 8*).—Continuing the studies of phosphorus deficiencies (E.S.R., 56, p. 366), it has been established that the condition is more or less prevalent in 30 counties of the State. Bone chewing is recognized as a specific symptom of phosphorus deficiency in its early stages, but this, together with the general depraved appetite, disappears in advanced cases of long standing.

Dry and lactating cows on low phosphorus rations showed in mineral balance tests that the deficiency was not necessarily accompanied by a marked negative phosphorus balance unless the cow was milking heavily. Both dry and lactating cows showed marked phosphorus storage when phosphate supplements were added to the deficient ration. Any desired stage of phosphorus deficiency could be experimentally produced in cattle. A detailed description is given of these experimentally produced conditions, showing how rapidly the symptoms may develop under different methods.

The use of the concentration of inorganic phosphate in the blood plasma as an index of the severity of cattle aphosphorosis is presented, together with additional data showing "(1) the great rapidity with which phosphate feeding causes a recovery from depleted blood phosphate, (2) the rapidity with which the concentration falls in aphosphorosis at different levels of phosphorus deficiency, when other influencing factors are equal, (3) the extent to which milk production decreases blood phosphate concentration in aphosphorosis, and (4) the detrimental influence of a high calcium level in the ration on the rate of fall of blood phosphate during phosphorus deficiency."

A summary is also presented of the physiological factors that have been suspected of causing the large fluctuations in the concentration of inorganic phosphate in the blood plasma.

Fresh bone from cattle suffering from aphosphorosis showed a marked reduction in ash and its replacement by lipid material. The moisture-free and fat-extracted bones were characterized by low total ash and a lower calcium phosphate with a higher calcium carbonate content, giving an abnormally low calcium-phosphorus ratio, than was found in normal bone. The results of two experiments showed no marked difference in the value of sodium acid phosphate and the phosphate forms in natural foods for relieving phosphorus deficiency.

The primary cause of aphosphorosis in the State was due to animals subsisting chiefly on hay of consistently low phosphorus content. Adding a phosphorus supplement to the ration of young cattle brought about an immediate stimulation of the appetite and a more efficient food utilization. Milking cows on a ration complete except for phosphorus had a relatively short milking period and a low total production, but when phosphorus was added more milk was produced over an extended lactation period. Cows fed adequate amounts of phosphorus prior to and during lactation produced greater amounts of milk than when the same animals were on a ration deficient in phosphorus. Long-time feeding tests with magnesium sulfate in the form of Epsom salt did not show that this mineral was an important factor in producing phosphorus deficiency. There was evidence that the percentage calf crop was reduced by a phosphorus deficiency.

The problem of phosphorus deficiency is discussed from the standpoint of the phosphorus content of the common dairy feeds of the State, the increase of forage phosphorus in various areas by means of phosphate fertilization of the soil, and the use of a mineral supplement.

Appended is a discussion of the methods of chemical analyses used in this study.

Vitamin A and carotene.—IX, Notes on the conversion of carotene to vitamin A in the cow, T. Moore (*Biochem. Jour., 26 (1932), No. 1, pp. 1–9, fig. 1*).—Continuing this series of studies (E.S.R., 67, p. 501), the liver and butterfat obtained from different cows were examined by the colorimetric method for carotene and vitamin A. Special attention was given to a comparison of samples obtained from Jersey cows and those from other breeds. Tests were also carried out to determine the effects of feeding carotene, as carrots or red palm oil, on the degree of pigmentation and vitamin A content of butterfat at the end of the winter feeding period.

The results showed that while the body fat of the cow was normally characterized by the presence of small amounts of carotene, vitamin A as such was found in greatest amounts in the liver and milk fats. This suggested that carotene in the cow's body underwent a conversion to vitamin A. The suggestion was supported by the fact that the winter feeding of carotene increased not only the carotene content but also the vitamin A content of the butterfat. The degree of pigmentation of butterfat when adequate amounts of carotene were fed was determined by the breed of the animal, being more intense in Jerseys than in Shorthorns. While on pasture, the amount of carotene and vitamin A in the butterfat was small in comparison with the amount available in the diet. However, when animals were fed in the barn on rations practically free of carotene the reserves of vitamin A stored in the liver and elsewhere were not sufficient to meet the needs of a prolonged milking period. Under such conditions a small allowance of carrots or other feed rich in carotene was sufficient to restore a positive balance.

Fitting and showing dairy cattle and major cattle breeds, G. E. Taylor and W. D. Burrington (*Michigan Sta. Circ. 147 (1933), pp. 28, figs. 30*).—The selection, feeding, and preparation of dairy cattle for showing are discussed.

The Cornell University dairy herd, 1889 to 1928, H. H. Wing (*New York Cornell Sta. Bul. 576 (1933), pp. 64, figs. 20*).—This is a history of the beginning and the development of the university dairy herd.

Dairying: Farm and factory, H. H. Dean (*Toronto: Ryerson Press, [1932, 6. ed.], pp. XIII+285, figs. 86*).—This treatise is concerned with the proper care and handling of milk and milk products on the farm and in the dairy plant.

On the colloidal calcium phosphate of milk, G. T. Pyne and J. J. Ryan (*Roy. Dublin Soc. Sci. Proc., n.ser., 20 (1933), No. 31, pp. 471–476*).—Acidities obtained for fresh milk to which a soluble oxalate had been added at University College, Cork, were not related in any apparent manner to the initial acidity of either the unoxalated milk or of the milk serum. Acidities appeared to depend largely on the colloidal phosphate content of the milk. This colloidal phosphate was chiefly in the form of tricalcium phosphate.

Laboratory studies on the chemistry of soft curd milk, S. M. Weisberg, A. H. Johnson, and E. V. McCollum (*Jour. Dairy Sci., 16 (1933), No. 3, pp.*

225–247, figs. 6).—This investigation consisted primarily of analytical and physicochemical studies of soft-curd milk.

It was found that a high concentration of casein was associated with hard-curd milk and a low concentration with soft-curd milk. There were clear indications that the concentration and manner of dispersion of the fat were important in influencing the curd character. Hard-curd milk had a higher concentration of calcium and phosphorus than did soft-curd milk. The concentration of the individual whey constituents and the whey constituents as a whole exhibited little or no influence in differentiating a soft-curd from a hard-curd milk.

A correlation of the results of quantitative analysis with measurements of viscosity, conductivity, and buffer action established the fact that the suspensoid phase differentiated a soft- from a hard-curd milk. In other words, the fat, casein, and calcium phosphates appear to control the curd character by their concentration and manner of dispersion. Attempts to find significant differences in the composition of caseins from soft- and hard-curd milks were unsuccessful.

A weighted mean method of averaging bacterial counts of milk, J. W. Bigger and L. L. Griffiths (*Jour. Bact., 25* (*1933*), *No. 3, pp. 253–260*).—In this paper from Trinity College, Baile Atha Cliath (Dublin), the authors describe a weighted mean method of estimating the average bacterial count of a series of individual counts of milk. The weighted mean is calculated by finding the mean of a series as follows: (1) Of the whole series, (2) of the whole series less the highest and lowest, and (3) of the whole series less the two highest and two lowest, and so on. This method is applicable to any series of three or more items, but the greater the number of items the more reliable were the results. The weighted mean impartially and equitably reflects the average bacterial content of milks.

Thermophilic bacteria in milk pasteurized by the high-temperature, short-time process, M. W. Yale and C. D. Kelly (*New York State Sta. Bul. 630* (*1933*), *pp. 23, figs. 4*).—The development of thermophilic bacteria during pasteurization by the high-temperature, short-time process was studied at nine market milk plants in New York and Pennsylvania. Four of the plants used the Electropure process, two the Isotherm, two the Precision, and one the York plate type pasteurizer. A total of 405 samples of milk were examined, using agar plates incubated at 56° or 63° C. for determining thermophile counts. The samples were collected during 38 pasteurizing runs and were taken at four stages of pasteurization.

Counts of thermophiles in 125 samples of milk entering the pasteurizers ranged from less than 10 per cubic centimeter to 4,500 per cubic centimeter, with 85 percent less than 100 per cubic centimeter. The counts at subsequent stages ranged between 40 and 50,000 per cubic centimeter. At two of the plants there was no noticeable development of thermophiles, at five plants a slight development, and at two plants a marked development. The type of pasteurizer did not appear to be a factor in the development.

It was found that the following plant practices were responsible for the growth of thermophiles in the pasteurizing equipment: (1) Repasteurization, (2) prolonged holding of hot milk in equipment as a result of a shut down, (3) passage of hot milk through the same filter cloth for 3 hours or more, (4) cooking of milk solids onto the walls of the regenerative heater, and (5) faulty sterilization of equipment.

The source of the volatile acidity produced in milk by the citric acid fermenting streptococci, M. B. Michaelian and B. W. Hammer (*Jour. Dairy Sci., 16* (*1933*), *No. 2, pp. 157–164*).—The results of a study at the Iowa Experiment Station confirmed previously reported observations (E.S.R., 46, p. 76) that the addition of lactic acid to milk cultures of the citric acid fermenting streptococci increased the volatile acidity produced, and also showed that tartaric, phosphoric, and sulfuric acids gave essentially the same increases in volatile acidity.

It was presumed that the influence of the various acids involved the establishment of an H-ion concentration that was very favorable for the production of volatile acid in milk by these organisms and may include the freeing of citric acid from its salts. Acids gave the greatest increase in volatile acidity with cultures that produced comparatively small amounts of titratable acidity, and vice versa. Since added citric acid brought about such large increases in volatile acid produced, it was evidently a source of volatile acid. The importance of this acid as a source of volatile acid was also shown by the marked increase in volatile acid production when citric acid was added to a modified beef infusion bouillon or to milk that had been fermented to remove the citric acid and then distilled to drive off the volatile acids.

Acid milk in bovine mastitis, F. S. Jones and R. B. Little (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 111–119*).—Continuing this investigation (E.S.R., 69, p. 586), a study was made of milk immediately after it was drawn from the udder.

It was found that in general the components of the milk and bacterial population were similar in the cases of mastitis characterized by acid milk. The total color reacting substances considered as proteins or their split products were increased by this condition, and the increase was comparable to the increase of whey proteins. The quantity of lactose secreted during attacks of mastitis was small, indicating a severe involvement of the secretory structures. In all cases the condition was characterized by a large number of nonhemolytic streptococci and leucocytes in the secretion, and lactic acid was also present. The condition was correlated with the enormous growth of carbohydrate-attacking streptococci within the udder in a relatively poorly buffered altered milk medium.

Controlling ropy milk outbreaks, C. D. Kelly (*New York State Sta. Bul. 631 (1933), pp. 18, fig. 1*).—An investigation of an outbreak of ropy milk was undertaken at a plant that had been troubled with this condition over a period of two years.

The equipment and method of handling the milk were studied, and it was found that the ropiness was due to bacteria which gained entry through pipes that were used first for raw and later for pasteurized milk. Milk returned from stores and wagons after it had become ropy aggravated the condition. One lot of such milk contained as many as 32,000 ropy bacteria per cubic centimeter. Keeping this returned milk out of the plant and correcting methods of handling the milk made it possible to free the equipment of the organisms by means of steam, hot water, and chlorine.

A short review is also given of two such outbreaks on farms, with recommendations for correcting the trouble.

The significance of colon bacteria in milk, with special reference to standards, J. M. Sherman and H. U. Wing (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 165–173*).—This study at the New York Cornell Experiment Station was concerned with the application of the "colon test" as a sanitary index to raw milk as it is received from the producer or as it is delivered to the consumer.

The results indicated that the test as now used in some places is of no particular value as an index to the sanitary conditions surrounding the production of raw milk. This applied to all milks except those which were so handled that bacterial growth was prevented. For high-grade raw milks containing less than 10,000 total bacteria per cubic centimeter the colon test may be used as a supplementary index of quality, and a standard of less than 100 per cubic centimeter for such milk would not be unreasonable. For certified milk, the standard of less than 10 colon organisms per cubic centimeter is not unduly stringent. If all milk was promptly cooled to 45° F. and held at that temperature, this test might prove to be of more general value.

A simplified method for cleaning milking machine rubber parts, C. K. Johns (*Sci. Agr., 13 (1933), No. 7, pp. 460–465*).—The Central Experimental Farm, Ottawa, undertook a series of two studies to confirm the results of Parfitt (E.S.R., 66, p. 168) on the use of lye solution for cleaning milking machines. It was found that the weak lye solution advocated was the most generally satisfactory antiseptic for milking machine tubes. Its detergent properties made it possible to keep tubes in a sanitary condition without the use of hot water. This was of special importance to producers lacking steam or hot water, since it meant that they could produce acceptable milk with a milking machine.

Sterilization of milk cans by a gas torch flame, J. C. Marquardt (*Milk Dealer, 22 (1933), No. 12, pp. 50, 52 fig. 1*).—The New York State Experiment Station undertook a preliminary study of a gas torch flame for sterilizing milk cans that had been properly washed and rinsed. The flame used attained a temperature of 1,950° F., and cans were exposed to it for 8 seconds after the full blast of the flame entered the can. For testing the sterilizing effect of the flame, 500 cc of a contaminating water containing miscellaneous milk-grown infection and a high contamination of bacteria that ferment lactose with the production of acid and gas was introduced into the cans after they were washed and rinsed. After draining, one can was rinsed with 500 cc of sterile water from which plates were made to study the bacterial condition. Another can was heat-treated and then rinsed with 500 cc of sterile water, and plates poured. The bacterial examination showed that the heat treatment could reduce the contamination from 600,000,000 to 500 bacteria per can. It was suggested that this type of heat treatment offered a means of economically and effectively treating cans, especially as the last step in the large power can washer.

The vitamin A activity of butter produced by Guernsey and Ayrshire cows, J. W. Wilbur, J. H. Hilton, and S. M. Hauge (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 153–156, fig. 1*).—At the Indiana Experiment Station the Ayrshire and Guernsey breeds, because of the difference in the color of their milk, were selected for a study of the relative vitamin A activity of butters produced under similar nutritive conditions. One group of Ayrshire and two groups of Guernsey cows were used.

An analysis of the butters showed that Guernsey butter contained 3.6 and 4 mg of carotin per 100 g of butterfat, while Ayrshire butter had only 1.8 mg of carotin. However, the vitamin A activity was found to be similar regardless of the breed of cows or the color of the butter.

The influence of media upon the yeast and mold count of butter, E. H. Parfitt (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 141–147*).—Because of differences of opinions among workers, the Indiana Experiment Station made a study of the relative merits of the various media that may be used for yeast and mold counts of butter.

The results of the study showed that whey agar prepared by rennet coagulation produced the lowest yeast and mold counts. The differences between the dehydrated agars prepared by a commercial concern were slight. In order to secure comparative yeast and mold counts it was found that either dehydrated whey, malt, or wort agars should be used.

The fungi found in butter, G. R. Bisby, M. C. Jamieson, and M. Timonin (*Canad. Jour. Res., 9 (1933), No. 2, pp. 97–107*).—The College of Agriculture, University of Manitoba, Canada, collected samples of butter from all of the creameries in the Province and examined them for mold content. The various species of molds isolated and their relative abundance are given in tabular form. A list of fungi recorded as occurring in butter is also presented. The authors point out that various kinds of fungi may enter butter, and that some species may develop objectionable colonies when the butter is held for some time. Suggestions are given regarding methods for lessening the mold development in butter.

Influence of different starters on the quality of Cheddar cheese, H. C. Hansen, H. A. Bendixen, and D. R. Theophilus (*Jour. Dairy Sci., 16 (1933), No. 2, pp. 121–127*).—The Idaho Experiment Station made a study of the quality of Cheddar cheese as affected by the use of various starters and cultures. The milk used was from the university herd, and the standard procedure for manufacturing Cheddar cheese was followed. Both raw and pasteurized milk was used for making cheese, and the amount of starters and cultures used varied with their type.

The use of Ericsson starter, a commercial product, resulted in a cheese with satisfactory flavor, body, and texture with either raw or pasteurized milk. Similar results were obtained with another commercial starter known as Ames 122. Cheese made with *Streptococcus lactis* culture had a flavor almost equal to and a body and texture superior to that of cheese made with the starters. When *S. paracitrovorus* was used in amounts less than 4 percent by volume in raw milk, a cheese with a characteristic bitter flavor and open body and texture resulted. With pasteurized milk, especially with that acidified with hydrochloric acid, a more desirable type of cheese was made. When used in amounts from 4 to 10 percent in pasteurized milk, the resulting cheese had a decidedly bitter flavor. The use of *S. citrovorus* in amounts ranging from 1 to 10 percent resulted in cheese with a distinctly bitter flavor and open body and texture. Cheese made with a mixture of the above-mentioned cultures was of fair quality.

Pasteurized milk produced cheese equal in flavor and superior in body and texture to that made from raw milk. Cheese made from pasteurized milk had a higher moisture content when fresh than that made from raw milk, and during a storage period of 18 weeks lost more moisture than the raw-milk cheese. Slightly higher yields of cheese and slightly lower losses of fat in the whey resulted from the use of pasteurized milk. There were no significant differences in yields or fat losses in the whey with cheeses made with different starters and cultures.

Calcium and phosphorus of cheese made under controlled conditions, R. B. McCammon, W. J. Caulfield, and M. M. Kramer (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 253–263*).—Experiments were undertaken at the Kansas Experiment Station to study the calcium and phosphorus content of cheese of several types made under controlled conditions and conforming as closely as possible to accepted methods of commercial procedure. The types of cheese used were rennet and acid types of cottage cheese, cream, Neufchatel, Cheddar, and processed cheese. Samples of 54 cheeses, 50 of which were made in the laboratory, were analyzed.

The caloric values varied from 4.8 calories per gram for Cheddar cheese and 3.5 calories for cream cheese to less than 1 calorie for various types of cottage cheese. When made under known conditions Cheddar and processed cheese were about one third protein, commercial processed cheese one fourth, cottage and Neufchatel one sixth to one tenth, and cream cheese one fourteenth protein.

Rennet and acid types of cottage cheese did not show a significant difference in calcium content, but Cheddar cheese contained about ten times as much calcium as the soft cheeses. Only about 20 percent of the calcium in milk was retained in the soft cheeses, while 80 percent was retained in Cheddar cheese. The phosphorus content of the cheese appeared to vary according to the protein content. Soft cheeses retained approximately 37 percent and Cheddar cheese 38 percent of the phosphorus of the milk.

Some factors influencing the crystallization of lactose in ice cream, R. WHITAKER (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 177–202*).—In this article the author reviews the theories concerned with the crystallization of lactose in ice cream. The properties of supersaturated lactose solutions, the isomeric forms of lactose, and the rate of diffusion in ice cream at low temperatures are also discussed. Four methods of detecting lactose crystallization in ice cream were studied. One method was discarded after it was found to be unreliable, and another because of its complicated technic. The microscopic method and the detection of lactose crystals in the mouth were used in this study.

Experimental evidence indicated that the longer ice cream was in the freezer and the lower the temperature, the sooner the lactose crystallized. Rapid hardening, since it reduced the diffusion of the unfrozen portion, markedly slowed up lactose crystallization. Ice cream packaged by hand developed lactose crystals more rapidly than freezer-drawn packages, and much more rapidly in this respect than ice cream drawn in bulk. As a rule the lactose crystallized simultaneously throughout the entire mass. Mechanical shocks of various sorts were not significant factors in the formation of sand in ice cream. Introducing foreign particles into the ice cream increased the rate of crystallization. The pasteurizing temperature and not the temperature of homogenization influenced the rate of crystal development. Lactose crystals appeared sooner in ice cream containing dry and unsoaked nut meats than in ice cream made with soaked nut meats. Fat globule clumping, which increased the viscosity, retarded the crystallization of the lactose, and the same results were obtained by the addition of the divalent elements calcium and magnesium, whereas sodium salts had no effect.

The use of vegetable stabilizers in ice cream, W. J. CAULFIELD and W. H. MARTIN (*Jour. Dairy Sci., 16 (1933), No. 3, pp. 265–270*).—This investigation was undertaken at the Kansas Experiment Station to determine the chemical composition of representative groups of vegetable stabilizers used in ice cream, to observe their effects on certain properties of the standard ice cream mix, and to note their effect on the quality of the finished product.

The chemical analyses of five of these stabilizers indicated that gums were their active stabilizing agents. Ice cream mixes should be carefully adjusted so that they contain approximately 0.1 percent of gum. The stabilizers had no significant effects on the acidity, viscosity, or composition of a standard mix. Mixes containing these stabilizers did not freeze and whip so rapidly as those stabilized with gelatin. Two mixes containing vegetable stabilizers had an objectionable whey separation when held at 40° F. for from 24 to 48 hours after manufacture. The melting resistance was essentially the same for ice creams stabilized with vegetable stabilizers or gelatin, and the quality of the finished product was not significantly different.

VETERINARY MEDICINE

The early history of veterinary literature and its British development, [I], F. Smith (*Jour. Compar. Path. and Ther., 26 (1913), Nos. 1, pp. 1–32, figs. 2; 2, pp. 111–142, fig. 1; 3, pp. 193–223, pls. 3; 4, pp. 289–317, pl. 1, fig. 1; 27 (1914), Nos. 1, pp. 41–68, pl. 1; 2, pp. 97–129, fig. 1; 3, pp. 193–218, fig. 1; 4, pp. 285–299, pl. 1, figs. 9; 29 (1916), No. 4, pp. 318–335; 30 (1917), Nos. 1, pp. 1–28, pl. 1; 2, pp. 97–130; 3, pp. 210–242, fig. 1; 4, pp. 277–310, pls. 2; 31 (1918), No. 1, pp. 36–39*).—These first accounts, which form volume 1, deal with the subject prior to the eighteenth century.

The early history of veterinary literature and its British development, II–IV, F. Smith (*London: Baillière, Tindall & Cox, vols. 2, 1924, pp. VIII+244; 3, 1930, pp. VII+184, pls. 6; 4, 1933, pp. XXIV+161, pls. 12*).—In this continuation of the work above noted volume 2 deals with the veterinary literature of the eighteenth century, volume 3 with that of the nineteeth century from 1800 to 1823, and volume 4, which contains a memoir of the author and is edited by F. Bullock, with that of the nineteenth century from 1823 to 1860. The work is restricted after the period of the Renaissance to its growth in the British Isles. A chronological list of Sir Frederick Smith's published books and papers is included in volume 4 (pp. XIX–XXIV), as are photographs of 12 eminent veterinarians.

[Work in animal pathology and parasitology in California] (*Calif. Dept. Agr. Mo. Bul., 22 (1933), No. 4–5, pp. 187–191, 192–194, 205–215, 229–245, figs. 12*).—The contributions here presented are as follows: Bovine Tuberculosis Control in California, by C. U. Duckworth (pp. 187–191); Bang's Disease Eradication, by H. P. Bonnikson (pp. 192–194); Trichomoniasis of the Upper Digestive Tract of Chickens, by A. G. Gierke (pp. 205–208); Fluke Disease (Fascioliasis), by R. H. Mills (pp. 209–215); Poultry Disease Control Work in California, by H. W. Graybill (pp. 229–231); Disinfectants and Parasiticides in Relation to the Poultry Ranch, by H. A. Hoffman (pp. 232–239); Immunization against Infectious Laryngotracheitis in Chickens, by E. E. Jones (pp. 240–242); Nutritional Paralysis in Poultry, by H. A. Hoffman (pp. 243, 244); and Poisoning of Chicks with Nicotine Sulphate, by H. W. Campbell (p. 245).

[Work in comparative pathology and parasitology at the Kentucky Station] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 20–27*).—The work of the year relating to animal pathology here referred to (E.S.R., 68, p. 375) includes the following: *Salmonella aertrycke* infection of foals, differentiation of streptococci (see p. 243), the precention of breeding diseases in horses, the eradication of Bang abortion disease, infectious abortion, acidosis of pregnant ewes, animal parasites, and coccidiosis.

[Report of work in animal pathology at the Missouri Station] (*Missouri Sta. Bul. 328 (1933), pp. 20, 37, 38*).—The work of the year briefly referred to (E.S.R., 67, p. 457) includes changes in the composition of the blood of dairy cattle during milk fever (parturient paralysis), by C. W. Turner and H. A. Herman; studies of abortion-infected herds and the transmission of abortion infection in cattle from immune dams to progeny, both by C. Elder, A. W. Uren, and A. M. McCapes; the effect of length of storage period on swine blood samples, by Elder and McCapes; transmission of the Bang abortion infection of swine to cattle, low agglutination reactions in unbred virgin gilts, and a new disease affecting Missouri cattle, all by Elder; and blackhead in turkeys and leukemia in fowls, both by A. J. Durant and H. C. McDougle.

[Reports of the New York State Veterinary College at Cornell University for the years 1930–31 and 1931–32] (*N.Y. State Vet. Col. Rpts., 1930–31, pp. 226, figs. 22; 1931–32, pp. 190, pls. 7, figs. 10*).—Following reports of various committees, clinics, and laboratories, the contributions presented in the 1930–31 report (E.S.R., 66, p. 173) not previously noted include the following: Torsion of the Gravid Uterus in a Cat, by H. C. Stephenson, J. D. Sweet, and W. L. Williams (pp. 53–55); Nembutal, by H. C. Stephenson and H. J. Milks (pp. 56–60); Some Diseases of the Abdomen, by H. J. Milks (pp. 61–69); A Study of Some Factors That Influence the Agglutination Test for Bang Abortion Disease in Cattle, by C. H. Milks (pp. 85–116); Agglutinins in Extracts Prepared from the Tissues of Guinea Pigs Infected with *Brucella abortus*, by W. M. and H. M. Thomson (pp. 117–122); The Elimination of *Brucella abortus* from the Genital Tract of Unbred Heifers during Estrum, by W. M. Thomson (pp. 123–137); *Bacterium abortus* Infection in the Fowl, II, by H. L. Gilman and E. L. Brunett (pp. 149–166) (E.S.R., 66, p. 174); The Distribution of Acid-Fast Bacteria in Soils, by C. A. Frey and W. A. Hagan (pp. 187–194); The Constituents of the Blood and Serum of the Lactating and Non-lactating Cow, by C. E. Hayden, J. Sampson, and W. T. Miller (pp. 195–199); and A Study of Milk Fever, by C. E. Hayden and J. Sampson (pp. 200–224).

The contributions presented in the 1931–32 report not previously noted include the following: A Preliminary Survey of the Cestodes and Nematodes in Parts of New York State, by D. W. Gates (pp. 59, 60); Some Diseases of the Mouth in Small Animals, by H. C. Stephenson (pp. 73–77); Tumors of Small Animals, by H. J. Milks (pp. 78–85); Some Studies on the Use of Rotenone as a Canine Insecticide, by D. B. Crane (pp. 86–120); Anemia In Young Pigs, by J. W. Benner and C. M. McCay (pp. 133–153); and The Nature and Economic Importance of Bang's Disease of Cattle (pp. 163–170) and Some Principles Underlying Official Regulations for the Control of Bang's Disease (pp. 171–176), both by R. R. Birch.

[Report of work in animal pathology in Texas] (*Texas Sta. Rpt. 1932, pp. 8–13, 15, 185–191, 196–199*).—The work of the year referred to (E.S.R., 67, p. 739) includes that with loin disease of cattle, bovine infectious abortion, sore mouth in lambs and kids, poisonous plant investigations with *Baccharis neglecta*, *Sloidago serotina*, and *Conium maculatum*, and a new liver disease of sheep and cattle, all by H. Schmidt; loco weed poisoning, in cooperation with the U.S.D.A. Bureau of Animal Industry, and miscellaneous poisonous plants (*Senecio longilobus*, *S. riddellii*, *Sophora scundiflora*, *Podophyllum scoparium*, *Nolina texana*, *Baileya multiradiata*, and *Asclepias latifolia*), both by F. P. Mathews; and loco poison, by G. S. Fraps and E. C. Carlyle. Work at the Sonora Substation, also reported upon, relates to the toxicity of bitterweed (*Actinea odorata*), contagious ecthyma (sore mouth) of sheep and goats, including field experiments with the vaccine, swellhead of sheep and goats, and salt mixture experiments, all by I. B. Boughton and W. T. Hardy; hard, yellow livers in sheep and cattle, including a vegetation survey, and icterohemoglobinuria of sheep, by Boughton, Hardy, and V. L. Cory; and control of harmful range plants, including bitterweed, in cooperation with the Texas Livestock Sanitary Commission, by W. H. Dameron, Boughton, Cory, Hardy, S. E. Jones, W. H. Hill, and T. A. Bond.

Annual report of the veterinary service for the year 1932, R. J. Roe (*Cyprus Dept. Agr. Ann. Rpt., 1932, pp. 27–38*).—Included in this report is an account of the occurrence of and control work with infectious and parasitic diseases of livestock.

Textbook of slaughter animals and meat inspection, R. von Ostertag (*Lehrbuch der Schlachtvieh- und Fleischbeschau. Stuttgart: Ferdinand Enke, 1932, pp. XIX+1208, pls. 5, figs. 358; rev. in Vet. Jour.*, 88 (*1932*), *No. 6, p. 269*).—This work deals with the subject in 17 chapters, each with an extended list of references to the literature. Although given a new title, it is in a measure a new edition of the author's Handbook of Meat Inspection, an English edition of which has been noted (E.S.R., 16, p. 96).

Practical food inspection.—I, Meat inspection, C. R. A. MARTIN (*London: H. K. Lewis & Co., 1932, vol. 1, pp. VII+312, figs. 138*).—The several chapters of this volume on meat inspection deal with the subject as follows: Physiology and comparative anatomy; age indications, sexual differences, and ante-mortem inspection; slaughterhouses and slaughtering—dressing of animals and preparation for sale; a system of meat inspection; physiological abnormalities, etc., and malformations; pathological abnormalities; infectious diseases; parasites; and preservation of meat. A glossary of terms and an index are included.

[Studies on the normal blood, I–III], J. L. BRAKEFIELD (*Howard Col. [Ala.] Bul., 88 (1930), No. 3, pp. 18–22, 33–42; also in Jour. Lab. and Clin. Med., 18 (1933), No. 8, pp. 812–815*).—Of these studies on the normal blood, the results of which are presented in detail in tabular form, part 1 (pp. 18–22) relates to the blood of the dog, part 2 (pp. 33–42) to the blood of the human, and part 3 (pp. 812–815) to the blood of the guinea pig.

The work with the dog and guinea pig was conducted with a view to determining the hemoglobin percentage, the erythrocyte number, and the total and differential leucocyte numbers in normal animals of both sexes and of known ages and on various diets. With man, the total and differential leucocyte counts were made on males and females (1) at different periods in a day, (2) at a definite hour from week to week, (3) of ages from 16 to 35 years, and (4) in summer and winter.

Croton capitatus as a poisonous forage plant, L. L. BOUGHTON (*Kans. Acad. Sci. Trans., 34 (1931), p. 114*).—In tests conducted on rabbits the author has found *C. capitatus*, received from a farmer who had lost a number of cattle and suspected the weed as being responsible, to prove fatal. Death was usually accompanied by convulsive kicking and squealing.

Alpine kalmia (Kalmia microphylla) as a stock-poisoning plant, A. B. CLAWSON (*U.S. Dept. Agr., Tech. Bul. 391 (1933), pp. 10, fig. 1*).—In feeding experiments conducted by the U.S.D.A. Bureau of Animal Industry in Utah, evidence was obtained that sheep may be affected by as little as 0.3 percent of their own weight of the green leaves of alpine kalmia (*K. microphylla*), and that they may consume as much as 2 percent without being fatally poisoned.

"Symptoms, which are principally weakness and nausea, accompanied with salivation and vomiting, may develop within less than 3 hours after a toxic dose has been eaten, or they may not be apparent for 14 hours or more. Poisoned animals may remain ill for more than 2 days and still recover. Alpine kalmia is sufficiently poisonous to be a source of danger to sheep, goats, and cattle, sheep being the most susceptible. Experimental data strongly indicate that it is approximately equally poisonous at all stages of growth and in different localities."

The account includes a review of the literature in connection with a list of 15 references, a description of the plant and its distribution, and the experimental procedure.

Additional information concerning larkspur poisoning, A. B. CLAWSON (*U.S. Dept. Agr., Farmers' Bul. 988, Sup. (1933), pp. 2*).—This sheet, supplementary to the account given in Farmers' Bulletin 988 (E.S.R., 39, p. 788) and requiring some modifications in the earlier conclusions, presents the practical results of field observations and experimental feedings made with *Delphinium barbeyi* in 1932.

Referring to the quantity of the plant necessary to poison cattle, it is stated that when the leaves from fresh, normal plants that have not yet formed flower buds are eaten within an hour or so an amount as little as 0.5 percent of the animal's weight is likely to poison the animal and 0.7 percent may kill it. It is pointed out that inasmuch as the older plants contain very much less moisture than the younger ones, any comparison of the quantities required to poison at different stages of growth should be made on a dry-plant basis. On this basis leaves from plants that are in bud are about one half as poisonous as leaves from very young plants. Similarly, leaves from plants in flower are from one third to one fourth and those from plants in fruit only about one sixteenth as poisonous. The results of feedings made in August 1932 further indicate that the leaves from plants that had blighted before forming flower buds were about one third as poisonous as the leaves of very young, normal plants, and that those from plants that had blighted while in bud were about one fifth, and those from plants that had blighted while in flower were about one eleventh as poisonous.

In experiments with sheep a quantity of the plant in bud equal to 3 percent of the animal's weight fed in a relatively short time was the smallest that produced definite poisoning. Compared on a dry-plant basis, leaves from plants in fruit were about one half as toxic to sheep as were the leaves from young, healthy plants. From the results of the feedings and field observations it is concluded that although it is possible to poison sheep by *D. barbeyi*, cases occur on the range only under abnormal conditions. Further experimental work has confirmed the beneficial effects of the treatment previously described.

The author points out that in handling livestock on the ranges it is safest to assume that all the species of larkspur are equally dangerous and produce the same effects on animals.

Antigen nephelometer solidified with pectin, H. R. and G. L. BAKER (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 4, pp. 472, 473*).—In this contribution from the Delaware Experiment Station and the State Board of Agriculture, an antigen nephelometer devised by solidifying antigen in a gel with a colorless pectin and sugar is described. It is thought to overcome the objection to the McFarland nephelometer scale and furnish a standard that is more permanent and more similar in appearance.

The differential diagnosis of diseased conditions and abnormalities of the mouth and feet of cattle, sheep, and swine, with particular reference to foot-and-mouth disease, G. EATON (*Vet. Rec., 13 (1933), No. 35, pp. 848–859*).—These affections are considered under their respective hosts.

Hemolytic streptococci of horses and other animals and their relation to the streptococci of man, W. W. DIMOCK and P. R. EDWARDS (*Kentucky Sta. Bul. 338 (1933), pp. 23–53*).—In the work conducted, preliminary accounts of which have been noted (E.S.R., 69, pp. 111, 714), the authors call attention to the fact that there is a large group of low-acid-producing, nonsodium-hippurate-hydrolyzing hemolytic streptococci which infect horses and other species of lower animals.

"*Streptococcus equi* is a specific bacteriological entity which can be distinguished from other hemolytic streptococci studied by its inability to ferment lactose, sorbitol, or trehalose. Cultures from influenza, pneumonia, and infectious rhinitis of horses were found identical with cultures from metritis of mares and joint ill and septicemia of foals. Cultures from cows, hogs, chickens, foxes, rabbits, and guinea pigs were indistinguishable from the streptococci from horses. The animal cultures, other than *S. equi*, are divisible into three types according to their reactions in lactose, sorbitol, and trehalose. Ninety-six percent of the animal strains ferment sorbitol but do not ferment trehalose. Human cultures, without exception, were found to ferment trehalose but did not attack sorbitol. The sorbitol-fermenting cultures often are mistaken for *S. epidemicus* since they produce distinct capsules. Sorbitol-fermenting hemolytic streptococci probably do not cause septic sore throat and are rarely, if ever, present in human disease."

The contribution includes a list of 49 references to the literature cited.

Certain phases of the problem of Rocky Mountain spotted fever: A summary of present information, R. R. PARKER (*Arch. Path., 15 (1933), No. 3, pp. 398–429*).—In this digest of information on the tick-transmitted virus *Dermacentroxenus rickettsii*, the author points out that within the limits of the United States the common wood tick *Dermacentor andersoni* and the American dog tick are known to be transmitters to man; that the Pacific coast tick, Lone Star tick, and the brown dog tick occurring in the southeastern United States are unquestionably potential, and, in the cases of the first two, perhaps actual carriers to man; and that two others, the rabbit tick and *D. marginatus*, which transmit infection in nature, are indirect agents of human infection. It is considered extremely probable that there are still other species which will be found to be actual or potential carriers.

Bang's-disease control, M. JACOB (*Tennessee Sta. Rpt. 1932, pp. 23, 24*).—A brief statement of the progress of control work with infectious abortion at the Middle and West Tennessee Substations (E.S.R., 68, p. 246), where both beef and dairy cattle are now free from the disease, as indicated by reactions to the agglutination test.

Pertaining to the eradication of Bang's disease, S. H. MCNUTT and F. E. WALSH (*Vet. Med., 28 (1933), No. 10, pp. 401, 402*).—A report is made of a cow that apparently was infected with *Brucella abortus* 21 months before she reacted. Another heifer from the same herd was infected for 13 months before reacting significantly.

Further studies of the lacto-vaccine in mastitis, C. S. BRYAN, M. M. BURLINGAME, and E. B. CAVELL (*Vet. Med., 28 (1933), No. 10, pp. 398–400*).—Contributing from the Michigan Experiment Station, the authors report upon two herds producing market milk infected with mastitis that were treated with gentian violet lactovaccine, a description of which by Bryan has been noted (E.S.R., 70, p. 94). The spread of mastitis in the two herds in which it was tested was halted, and 9 of a total of 11 mastitis-infected cows ceased eliminating streptococci or giving any signs of infection.

Contribution to the study of piroplasmoses in Greece.—III, Babesiellosis of sheep [trans. title], M. STYLIANOPOULOS and B. ANANIADÈS (*Bul Soc. Path. Expt., 26 (1933), No. 5, pp. 704–709*).—This further contribution (E.S.R., 69, p. 592) deals with babesiellosis of sheep, which was reported in Greece for the first time in 1927 at Florina. Investigation has shown that it occurs throughout Greek Macedonia and Western Thrace and causes serious losses, particularly in improved breeds, including the Merino, Friesland, and Karakul.

Coccidiosis of sheep in the southeast of the U.S.S.R., II [trans. title], D. N. ZASUKHIN (D. SASSUCHIN) and V. E. TIFLOV (V. TIFLOW) (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.), 11 (1932), No. 4, pp. 303–307, pl. 1, fig. 1; Eng. abs., pp. 306, 307*).—During the course of an epizootic which took place among sheep on a State farm in the lower Volga region, the authors found oocysts of *Eimeria faurei* Moussu and Marotel in the feces of the sheep. Of 534 sheep examined, 33.3 percent proved to be coccidium infected. The examination of the feces, post-mortem findings, and helminthological investigations led the authors to conclude that a single species, *E. faurei*, was responsible for the epizootic which took place among the sheep.

The localization of Ostertagia in the host animal, G. DIKMANS (*Jour. Parasitol., 20 (1933), No. 1, p. 65*).—A recent examination of 140 sheep stomachs (abomasa) showed that *O. circumcincta* was present in about 130 cases, all being found in the pyloric end of the abomasum. In only 1 of the 140 animals examined were nodules found in the wall of the abomasum. *O. ostertagia* of cattle were usually located beneath a layer of mucus in the pyloric end of the fourth stomach.

Parasitological field trials with sheep: Results at "Frodsley," Tasmania, and "Meteor Downs," Queensland, I. CLUNIES ROSS and N. P. H. GRAHAM (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *6 (1933), No. 3, pp. 191–204, pl. 1*).—In experiments at Frodsley (E.S.R., 67, p. 601), "routine monthly treatment with carbon tetrachloride and copper sulfate led to no increase in wool or body weight in sheep mainly infested with small trichostrongylid worms. It is known that these parasites are resistant to any known treatment. There was, however, a marked improvement in wool quality in treated compared with untreated sheep, so that it is probable that treatment mitigates somewhat the adverse effects caused by these parasites. Sheep on improved pasture, either with or without treatment, showed marked increase in body weight and produced over 2 lb. more wool per head than the sheep on natural pasture, either treated or untreated. The only difference noted between treated and untreated groups on improved pasture was a slight improvement in wool quality in the treated sheep. The wool of sheep run on improved pasture was estimated to give as high, or higher, percentage clean-scoured yield as that of any sheep on natural pasture. The administration of sodium arsenite and copper sulfate in licks had no demonstrable effect in diminishing infestation with the large bowel parasites *Chabertia ovina* and *Oesophagostomum venulosum.*"

In experiments at Meteor Downs, "treatment with carbon tetrachloride under the conditions obtaining through this trial led to no increase in body weight in the treated animals as compared with the untreated animals. Treatment with carbon tetrachloride led to no increase in fleece weight nor significant difference in wool quantity. It is thought that the very low rainfall contributed largely to the lack of evidence of harm caused by parasites."

A century of hog cholera, A. T. KINSLEY (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 4, pp. 449–463*).—A contribution presented at the annual meeting of the American Veterinary Medical Association in August 1933.

Experimental studies in the transmission of swine erysipelas, G. T. CREECH (*Vet. Med., 28 (1933), No. 10, pp. 403–406, figs. 2*).—Summarizing the work here reported, the details of which are given in tabular form, the author finds that "a comparison of experimental results with the virulent character of swine erysipelas as it occurs under herd conditions shows by the marked contrast that there must be certain factors which influence the virulence of the organism in its natural environment which are now little understood. While field cases of acute swine erysipelas in pigs a few weeks of age are not uncommon, it is apparently difficult to infect pigs of this age experimentally. Out of a total of 22 pigs used in these experiments, definite symptoms of swine erysipelas were observed in 11 cases, or 50 percent of the animals subjected to the different methods of exposure. Of the 11 animals showing evidence of infection, 5 resulted fatally and 2 showed only slight symptoms of the disease. One of the five fatal cases was produced by feeding, two by culture inoculations, one by inoculation with splenic material from a field case of acute swine erysipelas, and one by inoculation with blood serum from a known natural case of the disease."

Skin penetration tests with infective larvae of the swine kidney worm Stephanurus dentatus, L. A. Spindler (*Jour. Parasitol., 20 (1933), No. 1, pp. 76, 77*).—The author's studies indicate that infective kidney worm larvae in water on the intact skin of pigs are unable to infect these animals, thus confirming the findings of Schwartz and Price (E.S.R., 66, p. 574). The fact that infection occurred when cultures containing infective larvae were spread on the intact skin of pigs indicates that some unknown factor, probably traction, plays a part in the penetration of intact skin by these larvae.

Colics in horses caused by parasites, H. L. Van Volkenberg (*Puerto Rico Sta. Agr. Notes No. 64, 1933, pp. 3*).—In this mimeographed account of the colics of equines due directly or indirectly to helminths, the author considers their nature, parasite involved, prevention, and remedial measures. It is pointed out that in Puerto Rico these colics seem to occur only as enzootics during the last of November and first of December, although in St. Croix they usually occur following the lighter rains of the rainy season. The adult strongyle parasites which apparently cause these colicky conditions are located in the cecum and the colon, three species of large strongyles and several species of small strongyles having been found in equines in Puerto Rico. The aneurysms which may result in embolic colic are said to have been found in every autopsy made by the author thus far on horses. In one outbreak in November 1931 investigated, the tapeworm *Anoplocephala perfoliata* was suspected of being an important contributing cause.

Transmission of infectious equine encephalomyelitis in mammals and birds, L. T. Giltner and M. S. Shahan (*Science, 78 (1933), No. 2012, pp. 63, 64*).—In experimental work with a strain of encephalomyelitis virus recovered by the authors in 1932 from the brain of a field case in South Dakota where the disease was epizootic, the sheep, dog, and cat were found to be definitely refractory. The inoculated calves developed a febrile reaction which persisted for several days. It is pointed out that the inoculation experiments conducted, though too limited for final conclusions, indicate that calves are not entirely refractory to encephalomyelitis. A 100 percent "take" in the case of pigeons indicates the possible use of these birds in routine examination of tissues from field cases. The possible relationship of the calf and the pigeon to the epizootiology of the natural disease is deemed worthy of consideration.

Respiratory infection in equine encephalomyelitis, L. R. Vawter and E. Records (*Science, 78 (1933), No. 2011, pp. 41, 42*).—At the Nevada Experiment Station equine encephalomyelitis has been transmitted to two horses by single instillations of 50 cc of Berkefeld filtered virus into the nostril.

The studies indicate that inanimate objects, such as feed racks and watering troughs, are not vectors of infection. During the preceding year "one corral has been used for horses inoculated with virus. Twenty inoculated horses have developed symptoms of encephalomyelitis and either died or were destroyed while in this corral. All new horses were purposely placed in this corral without any sanitary precautions whatsoever, other than removal of manure. The same feed racks and watering troughs were used. No spontaneous cases of encephalomyelitis have occurred, and all the presumably exposed horses proved susceptible to intranasal or intracerebral inoculation of virus one to four months later. The existence of virus carriers among otherwise healthy horses is suspected."

The period of incubation in experimental horses following intranasal exposure to virus agrees with the reports from practicing veterinarians that additional cases of equine encephalomyelitis usually occur in from 7 to 10 days after the first case came to clinical notice.

The effect of N-butylidene chloride on colts infested with ascarids, P. C. Underwood (*Jour. Parasitol., 20 (1933), No. 1, pp. 77, 78*).—Five colts, 4 to 7 months of age, were given N-butylidene chloride at a dose rate of 0.2 cc per kilogram of body weight after a 36-hour preliminary fast. This was followed 4 hours later by a purgative dose of raw linseed oil, graduated according to the weight of the animal, the largest colt receiving 16 oz. and the smallest colt receiving 10 oz. of oil. The growth rate of the colts was not reduced but actually showed gains. During the 4 weeks prior to treatment, the colts showed an average weekly gain of 2.63 kg each. The average weekly gain for 4 weeks after treatment was 6.40 kg each. The colts showed a marked improvement in physical condition after treatment and passed many ascarids.

Septicemias due to B. coli and B. viscosum in the young mule are largely of verminous origin [trans. title], J. Basset and A. Moulin (*Rev. Vét. [Toulouse], 85 (1933), June, pp. 305–320, pls. 5*).—The authors conclude that so-called verminous diseases are very often due to the concurrence of parasites and microbes. The septicemias of young mules observed by the authors, in which intestinal strongyles were present, were caused by *Bacillus coli* or by *Bacterium viscosum.*

The efficacy of pigeon pox vaccine in the vaccination of chickens against fowl pox, J. P. Delaplane and H. O. Stuart (*Rhode Island Sta. Bul. 238 (1933), pp. 8, fig. 1*).—In the work conducted a number of the chickens which had been vaccinated at 6, 8, 10, 12, and 14 weeks of age with pigeon pox vaccine and tested for immunity to fowl pox after a duration of 4 months were found susceptible to artificial and contact infection with fowl pox.

"White Leghorn pullets vaccinated with pigeon pox vaccine and tested for immunity to fowl pox after a duration of 2 months were all found resistant with the exception of one. White Leghorn pullets vaccinated with pigeon pox vaccine while in production or coming into production showed a decline in production beginning 2 to 3 weeks following vaccination. Susceptible birds which were placed in contact with birds vaccinated with pigeon pox vaccine remained free of infection.

"Field observations of flocks in which pigeon pox vaccine had been used would tend to confirm these results with regard to the duration of immunity, as a number of outbreaks of fowl pox have occurred among them. It would seem that, until further experimental work should prove otherwise, fowl pox vaccine would be the more reliable product for practical application."

Transfusion experiments with the blood of leukemic chickens, F. P. Crank and J. Furth (*Arch. Path., 14 (1932), No. 5, pp. 660–670, figs. 3*).—In experimental work conducted, 9 of 15 fowls into which leukemic blood had been transfused died of leukemia from 2 to 3½ days after the transfusion. "The fatal leukemia in these instances was associated with multiplication of the transfused cells. Thus, when immature myeloid cells of the fowl have been stimulated by the filtrable agent of leucosis, they assume the character of tumor cells and are capable of autonomous growth. A considerable proportion of the transfused cells was rapidly removed from the circulation in all the fowls. The spleen and the capillaries of several organs, mainly those of the liver and the lung, are active in performing this function. The bone marrow plays little part in the removal of the immature myeloid cells. In susceptible fowls, the cells retained multiply in these sites; in resistant fowls, they are disposed of by mononuclear phagocytes of the liver and spleen."

Inheritance of resistance to fowl paralysis (neurolymphomatosis gallinarum), J. Biely, V. E. Palmer, I. M. Lerner, and V. S. Asmundson (*Science, 78 (1933), No. 2011, p. 42*).—Reference is made to studies conducted which indicate that resistance to fowl paralysis depends upon a dominant gene and point to the conclusion that in the stock used only one pair of genes was involved. No evidence of sex linkage was observed. "It appears that the proportion of paralyzed to normal birds in any transmission experiment would depend on the genetic constitution of the chicks as regards resistance or susceptibility to fowl paralysis. Hence a genetic analysis of the material is necessary in evaluating the results of fowl paralysis transmission experiments."

The elimination of Bacterium gallinarum in the egg and the agglutinin content of the blood of fowls artificially and naturally infected with Salmonella pullorum [trans. title], H. Hartwigk (*Deut. Tierärztl. Wchnschr., 41 (1933), No. 12, pp. 179–183*).—Hens artificially infected with pullorum disease were found to discharge the organism in the egg as late as 41 to 67 days after incubation. Agglutinins were first found present in the blood from 28 to 42 days after infection. The discharge of *B. gallinarum* with the eggs continued for several laying seasons in heavily infected hens, but in lightly infected ones for a shorter period. Egg production was checked at times to the point of unproductivity.

Control of avian tuberculosis in Illinois, H. D. Chamberlain (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 4, pp. 444–448*).—This is a contribution presented at the annual meeting of the American Veterinary Medical Association in August 1933.

Notes on cestodes of poultry, M. F. Jones (*Jour. Parasitol., 20 (1933), No. 1, p. 66*).—The author reports that the California valley quail *Lophortyx californica* was found to be a host of the poultry tapeworm *Hymenolepis carioca* at Winston-Salem, N.C. The ground beetle *Celia muscula* was found to be an additional host for the guinea fowl tapeworm *Raillietina magninumida.* Two naturally infested beetles were collected, and an additional specimen was infested after having been fed segments of the tapeworm. A chicken and a turkey remained free from tapeworms after being fed tapeworm cysts from *C. muscula.* A guinea fowl given cysts on June 10 and June 30, 1932, was passing gravid segments of *R. magninumida* on July 28. This bird was killed on January 13, 1933, at which time four specimens of this tapeworm were recovered.

The pathogenicity of Eimeria mitis Tyzzer, 1929, to 3-month-old chickens, E. A. Allen (*Jour. Parasitol., 20 (1933), No. 1, pp. 73, 74*).—The author reports having found seven of nine chickens that had been used for experimental infection with tapeworms, in which an outbreak of coccidiosis occurred, to have had a pure infection of *E. mitis*, the other two having a mixed infection of *E. mitis* and *E. tenella.* "Six of the seven chickens having a natural infection of *E. mitis* also were infected with the nematodes or cestodes, or both. One of the two chickens having mixed infections of *E. mitis* and *E. tenella* had a few tapeworms and a few *Ascaridia*; the other bird had no worm parasites. Five of the chickens, having no coccidia other than *E. mitis,* were heavily infected with this coccidium. Three of the five birds evidently recovered from the infection, since at the time of necropsy only a few oocysts of *E. mitis* were found in the small intestine of each bird. One of the two that did not recover was killed when nearly dead; it had no other parasites. The birds which had heavy infections of *E. mitis* were weak and passed blood during the highest peak of the infection; one of them died.

"The writer believes the severe hemorrhages and diarrhea observed in this group of seven chickens were due to coccidia, *E. mitis,* since past experience has shown that intestinal hemorrhages, causing bloody diarrhea, are not associated with infections of nematodes or cestodes. These observations indicate that *E. mitis* is pathogenic to chickens."

The occurrence of Eimeria truncata in the United States, E. A. Allen (*Jour. Parasitol., 20 (1933), No. 1, p. 73*).—The occurrence of *E. truncata* infesting the intestines and kidneys of 4- to 6-year-old goslings at Washington, D.C., in June 1932 is reported. The record by McNutt of its occurrence in goslings at Ames, Iowa, in 1929 is referred to (E.S.R., 62, p. 267).

Experiments with a filtrable virus detected in a transmissible disease of the canary [trans. title], W. Kikuth and H. Gollub (*Zentbl. Bakt.* [*etc.*], *1. Abt., Orig., 125 (1932), No. 5-6, pp. 313-320, pl. 1*).—An infection met with while engaged in chemotherapeutic experiments with bird malaria in the canary, and which caused an increase in the mortality from about 20 percent due to *Proteosoma praecox* to 100 percent in from 7 to 12 days, was found to be due to a virus filtrable through a Berkefeld N candle but not a Seitz disk.

Tests demonstrated the sparrow to be susceptible to the virus and that the pigeon, chick, and hen are resistant.

The virus remains infective at a dilution of 1 to 1,000,000.

A virus disease of the canary of the fowl-pox group, F. M. Burnet (*Jour. Path. and Bact., 37 (1933), No. 1, pp. 107-122, pls. 2*).—It is pointed out that the disease of canaries described by Kikuth and Gollub in 1932, above noted, is caused by a virus closely resembling certain fowl pox strains. This virus produced massive lesions when inoculated on to the chorioallantoic membrane of the developing egg, an improved technic for this type of inoculation being described.

"By filtration and microphotographic methods the diameter of the virus particles is estimated to be approximately 0.16μ. The disease is uniformly fatal to canaries, and no success has been attained in attempts to immunize with killed virus. The virus is pathogenic for sparrows producing typical lesions. Only an insignificant lesion is produced in the fowl, but a more definite transmissible inflammatory condition in the pigeon. In neither of these species are epithelial inclusions produced."

Of three fowl pox strains tested, one, Dalling (E.S.R., 63, p. 481), produced lesions in the canary similar to those produced by Kikuth's virus. The other two fowl pox strains and a pigeon pox strain have failed to induce specific lesions.

The microscopic appearance of the virus is described by J. E. Barnard (pp. 114, 115).

Helminths of economic importance in farm animals, excluding poultry, A. W. Noel Pillers (In *National Veterinary Medical Association of Great Britain and Ireland, Annual Congress at Llandudno, 1933. London, 1933. pp. 55, 56*).—These parasites are listed by hosts, including the horse, ox, sheep, and pig.

A simple method for the study of the sporulation of coccidial oocysts, K. Wagener (*Arch. Path., 14 (1932), No. 2, pp. 213, 214*).—The author's investigation has led him to recommend the following simple method of observation of the sporulation of coccidial oocysts:

Feces containing the oocysts are smeared thinly on the surface of an agar consisting of from 0.8 to 1 percent dissolved in distilled water and poured into Petri dishes. They can then be examined directly under the microscope by using the low magnification, the high magnification, or even the oil emersion systems.

Coccidiosis of the liver in rabbits, I-III, H. Smetana (*Arch. Path., 15 (1933), Nos. 2, pp. 175-192, figs. 4; 3, pp. 330-339, fig. 1; 4, pp. 516-536, figs. 8*).—The first contribution deals with an experimental study on the excystation of oocysts of *Eimeria stiedae*.

II. *Experimental study on the mode of infection of the liver by sporozoites of Eimeria stiedae*.—The author was led to conclude that "sporozoites of *E.*

stiedae reach the liver from the intestines by way of the portal radicals. This was demonstrated experimentally by (1) morphologic studies of the earliest lesions after oral infection, (2) exclusion of the biliary route by ligation of the extrahepatic bile duct of one of the lobes of the liver, subsequent to which oral administration of oocysts was nevertheless followed by infection of all the lobes of the liver, [and] (3) coccidiosis of the biliary tract after injection of liberated sporozoites into a mesenteric vein. Puncture of the gall bladder and examination of the bile for oocysts appear to be the most reliable method for determining past or present coccidial infection; biopsy of hepatic tissue alone is not satisfactory, unless the process is still active and diffusely scattered throughout the liver."

III. *Experimental study of the histogenesis of coccidiosis of the liver.*—The author reports that "the earliest recognizable lesions of schizogony in the liver occur about one week after infection. Gametogony sets in about two weeks after infection, and both cycles—schizogony and gametogony—are present at the same time until about three weeks after infection; from then on, only gametogony is found.

"Even diffuse experimental coccidiosis of the liver is not necessarily fatal; healing can take place after the exhaustion of gametogony, and is accomplished by the blockage of infected bile ducts by proliferating epithelial cells, followed by regeneration and reorganization of the biliary channels. The healing stage is characterized by the appearance of degenerated and nonfertilized oocysts in the feces. Diffuse cirrhosis of the liver may be the end result of coccidiosis of the liver. Previous infection of the liver with *E. stiedae* does not necessarily result in immunity to experimental reinfection. Because of the frequency of coccidial infection of the liver, resulting sometimes in cirrhosis, the use of rabbits for work on experimental cirrhosis of the liver cannot be recommended."

New snail and rabbit hosts for Fasciola hepatica Linn., W. H. Krull (*Jour. Parasitol., 20 (1933), No. 1, pp. 49–52*).—Experimental study has shown the snail *Fossaria modicella* Say to be a new secondary host of the liver fluke (*F. hepatica*), and the cottontail rabbit, *Sylvilagus floridanus mallurus* (Thoms.), to be a new primary host. Cecariae escaped from those snails which were subjected to infection when fully grown, in 32 days, but laboratory-raised snails infected when still small died before the cercaria-producing stage could be reached. Laboratory-raised snails of the species *Succinea avara* Say and *Lymnaea* (*Galba*) *palustris* Müll. and an opossum, *Didelphys virginiana* Kerr, could not be infected.

The development of the swine nodular worm Oesophagostomum dentatum in the guinea pig and rabbit, J. E. Alicata (*Jour. Parasitol., 20 (1933), No. 1, p. 73*).—An account is given of observations of the development of *O. dentatum* in two of four guinea pigs to which it was fed. In a rabbit to which infective larvae were fed in large numbers, raised nodules containing *O. dentatum* larvae were found throughout the cecum and colon. The presence of a small pearly-white, raised cyst, embedded under the capsule of the liver and containing a third-stage larva of *O. dentatum*, suggests that the larva may be found to migrate to the liver of the normal swine host.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Missouri Station], J. C. Wooley et al. (*Missouri Sta. Bul. 328 (1933), pp. 26, 27*).—The progress results of studies of horse and tractor labor costs, soybean harvesters, tile drains for Missouri soils, rural electrification in Missouri, cost of electric brooding, length of the grain harvesting period, and methods of milk cooling are briefly presented.

[Agricultural engineering investigations at the Texas Station], R. E. Dickson, D. Scoates, B. C. Langley, H. P. Smith, D. T. Killough, D. L. Jones, B. H. Hendrickson, R. W. Baird, H. V. Gieb, and H. O. Hill (*Texas Sta. Rpt. 1932, pp. 51, 102–104, 124–129, 151–154, 164–166*).—The progress results of investigations on run-off water losses in relation to crop production, mechanical harvesting of cotton, factors of efficiency in the distribution and placement of cottonseed and fertilizer, soil erosion, and moisture conservation are briefly reported. The studies on soil erosion and soil moisture conservation are being conducted in cooperation with the U.S.D.A. Bureaus of Agricultural Engineering and Chemistry and Soils and the investigations on placement of cottonseed and fertilizer in cooperation with the Bureau of Agricultural Engineering.

Irrigation with alkali water [trans. title], P. Bignami (*Agr. Colon. [Italy], 26 (1932), No. 12, pp. 585–589*).—A brief summary is given of work by others on the use of alkali water for the irrigation of vegetable and field crops, in particular indicating the tolerances of different crops to sodium chloride.

Experimental studies of natural purification in polluted waters.—VII, The selection of a dilution water for bacteriological examinations, C. T. Butterfield (*Public Health Rpts. [U.S.], 48 (1933), No. 24, pp. 681–691*).—Studies conducted by the U.S. Public Health Service are reported in which bacteriological examinations were made of samples from seven widely separated locations in the United States, using five different dilution waters and comparing the results.

It was found that phosphate dilution water and Formula C water gave the most consistent results. The phosphate water was prepared by adding 1.25 ml of stock phosphate buffer solution per liter of distilled water. Formula C water was prepared by adding to each liter of phosphate dilution water stock solutions consisting of 0.1 M calcium chloride, 2.5 ml; 0.04 M magnesium sulfate, 2.5 ml; and 0.001 M ferric chloride, 0.5 ml.

With a view to the development of a dilution water which can be used for both bacteriological and oxygen demand tests, it seemed desirable to standardize on the readily prepared phosphate water for further study, as it forms the basis for the more complete Formula C water. In the bacteriological examination of natural waters the dilution water employed must contain some mineral salts. The amount of mineral salts required in the diluting water, within the range found in natural waters, does not appear to be critical so far as the survival of the bacteria is concerned. If growth of the bacteria without lag is desired, it is probable that a degree of mineralization corresponding to that of the natural water would be more favorable.

The H-ion concentration of the dilution water also does not appear to require critical adjustment, providing it is not lower than pH 8.2, if survival of the bacteria for a short period only is desired. However, if growth of the bacteria without lag is desired, a pH of 7.5 should probably not be exceeded. Distilled water and dilution waters with H-ion concentrations in the zone of pH 9.0 or lower are decidedly bactericidal.

In making tests on the suitability of dilution waters, the examinations should be made after the water has been sterilized, for the sterilization process may very greatly alter the characteristics of the water. This is particularly true for tap and bicarbonate waters. Consideration must also be given to the glass container in which the dilution water is sterilized. Material dissolved from glass bottles of poor quality during autoclaving may make marked changes in the reaction and in the mineral salt content of the water.

Sewage farming in India, V. Subrahmanyan (*Cur. Sci. [India], 1 (1932), No. 6, pp. 157–160*).—In a contribution from the Indian Institute of Science, a brief account is given of the results of experiments made on some of the sewage farms in India.

The results over several years at the effluent farm near Poona show that by judicious irrigation with the effluent, very heavy yields of cane often amounting to double that obtained by water irrigation can be obtained. It is profitable to reduce the depth of water from 140 in., as generally used, to 80 in. Except in shallow soils the best results are obtained by watering at 10-day intervals. Application of even concentrated doses of effluent does not have any appreciable effect on the soil or on most of the crops that were tried.

The results of investigations at the Indian Institute of Science sewage farm show that under continuous irrigation with moderate quantities of sewage the electrolytes tend to increase though the organic matter does not persist. Even before reaching the stage of sewage sickness the soil attains a condition when either irrigation with water or a few showers of rain or fallowing becomes necessary prior to resuming cultivation operations. Generally leaf crops respond better to sewaging than grain or fruit crops, but even then frequent fallowing and rotation of crops is necessary to maintain high yields.

Stability of straight concrete gravity dams, D. C. Henny (*Amer. Soc. Civ. Engin. Proc., 59 (1933), No. 7, pp. 1071–1091, figs. 8*).—The necessity for abandoning the middle-third theory and the sliding factor as useful elements in masonry dam design is demonstrated in this paper. The author develops the fact that the safety of straight masonry dams is principally due to shear, and he investigates the effect of loading on shearing strength. A résumé is given of available data on uplift pressure, and estimates of effective uplift area and of uplift force are presented. Stability of dams of ideal triangular cross section is studied, and a shear safety factor is proposed for use in dam design.

The Levy requirement that loading at the water face must not be less than the water pressure at that elevation is found to be excessive for dams less than 500 ft. in height under most adverse conditions of uplift, and more logical requirements fitting these conditions are suggested. Numerical examples are given of shear safety factors on the basis of cross sections of existing dams. It is shown that the principles developed for straight concrete dams can be made equally applicable to other types of masonry dams.

Soil erosion: Causes and methods of control, H. B. Roe (*Minn. Univ. Agr. Ext. Spec. Bul. 160 (1933), pp. 24, figs. 24*).—Practical information is presented on the subject.

It has been found that sheet erosion is the most harmful type, and that the important contributing causes of erosion are certain current farming practices. The ultimate method of sheet erosion control is that of terracing practically all cropped slopes subject to erosion, coupled with cover cropping and contour cultivation. The best type of terrace for general use is considered to be the standard graded Mangum terrace. Crop rows may be run diagonally across the terraces, but contour planting and cultivation approximately parallel to the terraces are an effective aid in controlling sheet erosion and are recommended.

Fundamental principles of soil compaction, R. R. Proctor (*Engin. News-Rec., 111 (1933), No. 9, pp. 245–248, figs. 3*).—This is the first of a series of four articles describing the application to the design and construction of rolled-earth dams of recently developed methods for controlling the compaction of soils.

Under the new procedure a series of simple laboratory and field tests determines the suitability of the available soils, supplies essential data for the design of the dam, serves as a basis for the control of construction operations, and furnishes a definite check on the effectiveness of the work as it proceeds.

Methods are described for compacting soil so that they will be sufficiently watertight and will not become soft and unstable if completely saturated with water.

Preservative treatments of post woods, D. G. CARTER (*Agr. Engin., 14 (1933), No. 9, pp. 252, 253*).—This paper reports the results of seven years' field tests of preservative methods on post woods conducted at the Arkansas Experiment Station.

It was found possible to use specimens smaller than full-sized posts to determine the comparative value of preservative methods. The use of spray materials suitable as insecticides and fungicides is of little or no value in the preservation of wood in contact with the ground. Oak and pine, untreated, tended to fail at about equal rates. However, pine responded somewhat better to preservative treatment, due apparently to the greater absorption of preservative. Used motor oil in various processes indicated a range from complete protection to complete failure. Six lots, involving 36 specimens, indicated that the longer the processing time the greater the failure. Creosote gave almost complete protection, and zinc chloride and used motor oil gave results sufficient to justify further investigation.

Public Roads [August and September 1933] (*U.S. Dept. Agr., Public Roads, 14 (1933), Nos. 6, pp. 93–108+[2], figs. 12; 7, pp. 109–128+[2], figs. 19*).—These numbers of this periodical contain the current status of Federal-aid road construction as of July 31 and August 31, 1933, and the following articles: No. 6 contains Comments on the Hydrometer Method of Mechanical Analysis, by R. C. Thoreen (pp. 93–105); and Effect of Curing Conditions on the Strength of Cement Mortar, by D. O. Woolf and K. F. Shippey (pp. 106–108). No. 7 contains The Comparative Visibility of Standard Luminous and Nonluminous Highway Signs, by F. W. Mills (pp. 109–128).

A preliminary survey of the use of alcohol as motor fuel in various countries (*Ames: Iowa State Col., 1932, pp. [2]+4*).—Data are summarized for the United States and 17 other countries including the Philippine Islands.

Abstracts of the more important technical publications concerning the use of absolute alcohol in gasoline as a motor fuel (*Ames: Iowa State Col., 1933, pp. [2]+40, pls. 2*).—This is an extensive analytical review of the literature on the subject.

Solubility of ethyl alcohol in gasoline, O. C. BRIDGEMAN and D. QUERFELD (*Indus. and Engin. Chem., 25 (1933), No. 5, pp. 523–525, figs. 5*).—Studies conducted at the U.S. Department of Commerce Bureau of Standards on the solubility of ethyl alcohol containing various percentages of water in a number of gasolines are reported. The procedure used consisted in preparing quantitatively solutions of ethyl alcohol, of known water content, in gasoline (warming if necessary) and in measuring the critical solution temperature by noting the appearance of a second phase on cooling.

Data were obtained on 23 gasolines. In every case critical solution temperatures were measured on blends with aqueous ethyl alcohol solutions containing approximately from 99 to 93 percent of alcohol by volume.

It was found that the critical solution temperature decreases markedly as the concentration of water in the alcohol solution decreases and as the percentage of gasoline in the blend decreases. At each constant percentage of gasoline in the blend, it was found that the logarithm of the percentage, s, of water present was a linear function of the reciprocal of the critical solution temperature, T, in absolute Centigrade degrees, so that $\log s=a+\frac{b}{T}$. For straight-run fuels of the same volatility, the critical solution temperatures differed little from fuel to fuel. For straight-run fuels of similar volatility, the source of crude from which the gasoline is distilled appeared to have a comparatively minor effect. Topping a fuel of about the volatility of U.S. motor gasoline so as to reduce the 90 percent temperature approximately 40° C. produced a marked lowering in critical solution temperature. Increase of the volatility at the lower end of the distillation curve likewise produced considerable effect.

With the exception of two cracked gasolines, none of the gasolines studied would give sufficiently low critical solution temperatures to make practical the use in freezing temperatures of blended fuels containing up to 50 percent alcohol unless the alcohol was almost entirely free from water. Under such conditions addition of other materials to increase the solubility is necessary.

Road tests on alcohol-gasoline mixtures (*Ames: Iowa State Col., 1933, pp. 11*).—The results are briefly presented of (1) mileage and acceleration tests on 11 cars of different size and weight, (2) mileage and acceleration tests on a specially equipped test car, and (3) mileage and power tests on a test car equipped with a gas-electric drive.

It was found that the use of a blend of 10 percent alcohol and 90 percent gasoline results in a fuel mileage as good as that obtained with straight gasoline. At speeds of 10 and 20 miles per hour a 4 percent increase in mileage is evident when the blended fuel is used. At the higher speeds of 40 and 50 miles per hour this advantage disappears and equal mileages are obtained with both fuels. Improved acceleration and better performance are noted with the use of the blended fuel. Again the tests show that these increases in acceleration are greatest at the lower speeds. The conclusions indicate the following advantages for alcohol-gasoline mixtures: (1) Smoother operation, especially at idling speeds, and (2) elimination of any knocking present when ordinary gasoline is used.

The speed at which a car is driven has more effect on fuel consumption than any other item. On the average, a 10 mile decrease in speed is accompanied by a 10 percent increase in fuel mileage. It must be apparent, therefore, that comparable results from tests on both types of fuels can be obtained only when the same speed is maintained. Comparing the two fuels, it is apparent that the blended fuel has a slight advantage over regular gasoline. Both fuels are burned with the same ease and equal mileages are obtained in each case, but increased performance is noted when the blended fuel is used.

Knock rating tests of alcohol-gasoline mixtures (*Ames: Iowa State Col., 1932, pp. [1]+3*).—Tests to determine the octane number of each of three mixtures of alcohol and gasoline are reported. These included base fuel 90 percent plus alcohol 10 percent, base fuel 84 percent plus alcohol 15 percent and acetone 1 percent, and base fuel 80 percent plus alcohol 20 percent.

The increases in octane number of the mixtures over 100 percent gasoline were 9, 12, and 24 points, respectively. The use of 20 percent of alcohol produced a mixture considerably higher in octane value than commercial ethyl gasoline.

Hydrogen: A commercial fuel for internal combustion engines and other purposes, R. A. Erren and W. H. Campbell (*Jour. Inst. Fuel [London], 6 (1933), No. 29, pp. 277–285, figs. 6*).—A brief review is given of experimental work already conducted on hydrogen as a fuel, and the absence of detonation with suitable mixtures and its value as a diluent are emphasized. Methods of working the hydrogen-air engine are discussed, the economic performance of 45 percent brake thermal efficiency independent of load is stressed, and the performance and temperatures attained are compared with those of the gasoline engine. The oxyhydrogen engine, using steam as the diluent, and other applications of hydrogen as a fuel are described. Attention is drawn to the use of hydrogen as a promoter of combustion when mixed with fuels such as alcohol, and also as a primer in Diesel engines.

The use of synthetic methanol as a motor fuel, D. A. Howes (*Jour. Inst. Petroleum Technol., 19 (1933), No. 114, pp. 301–331, figs. 26*).—The results of experiments on high-duty, single- and multiple-cylinder engines using synthetic methanol as fuel are given.

Carbon deposits in gasoline engines, W. A. Gruse (In *Symposium on Motor Lubricants. Philadelphia: Amer. Soc. Testing Materials, 1933, pp. 7–21, figs. 4*).—This paper presents a review of available data on the formation of so-called carbon deposits in gasoline engines. The various factors influencing the rate and amount of deposit also are discussed and, where possible, actual experimental results are cited to show the magnitude of the effects described. Particular attention is given to the influence of lubricating oil on deposits, and a critical discussion is offered covering the several tests of lubricating oils proposed for the prediction of carbon-depositing tendency. The modification of engines to permit using highly refined oils of low viscosity is indicated as desirable.

It is indicated that if an engine without an air-cleaner runs cool on a rich air-fuel mixture with a high oil consumption, the oil being one of high carbon residue value, the engine will very probably encounter a great deal of trouble traceable to carbon deposits. The opposite conditions, dust-free air, a hot-running engine with a lean air-fuel mixture, and low consumption of an oil of low carbon residue value, will very probably induce freedom from excessive deposits. As regards the lubricating oil itself, the study suggests the desirability of hastening the day when the average motor can use, with tolerably low consumption, oils of lower viscosity than the present S.A.E. 40 and 50 grades.

A contribution to the theory of film lubrication, A. M. Robb (*Roy. Soc. [London], Proc., Ser. A, 140 (1933), No. A 842, pp. 668–694, figs. 16*).—This is a highly technical report on film lubrication between shaft and bearing, in which it is brought out that the assumption that the length of the bearing brass determines the length of the oil film under pressure leads to an unreal conception of the velocity conditions at the inlet end of the film and to unjustifiable curves of pressure along the film, and does not give results in harmony with those of actual experiment.

When consideration is given to the character of the curves of velocity across the film, from fixed surface to moving surface, it is seen that extent of brass is not a material factor in the problem and that the extent of the film is determined by other considerations.

Comparison of the experimental results recorded by Goodman in 1928 with those recorded by him in 1932 leads to the discovery of a serious flaw in the statement of the fundamental equation of Reynolds, namely,

$$\frac{dp}{dx}=6\lambda u\frac{h-h^1}{h^3}$$

in which p is the pressure, λ the coefficient of viscosity, x the measure in the direction of motion, u the velocity of the moving surface, and h the distance between the surfaces at any point other than that corresponding to h^1, which is the distance between the surfaces at the section where the pressure is maximum or minimum. The case of minimum pressure is, however, rejected from the immediate consideration. Accepted theory and all mathematical developments take h^1 to be the height at the section of maximum pressure and so to be a constant. h^1 is, however, a variable, and is a measure of the quantity of flow at any section. From this fact springs the necessity for dealing with the matter of side outflow of lubricant, and this in turn introduces a new conception, namely, side inflow.

On these modified conceptions it is shown that for any radial clearance the coefficient of friction is dependent upon eccentricity alone. Further, on these modified conceptions it is possible to obtain agreement between experiment and calculation, both as regards load-carrying capacity and attitude-eccentricity locus.

The effect of metallic (lead) dope on the carbonisation of oil in the combustion space of an engine, R. O. King (*Engineering* [*London*], *136* (*1933*), *No. 3528, pp. 183–186, figs. 7*).—Studies on the effect of tetraethyl lead dope on piston lubrication are reported. The dope was added to the oil as ethyl fluid containing lead tetraethyl and ethylene dibromine, 60 and 40 parts by volume, respectively. The lubricating oil was a proprietary mineral blend in general use.

The experiments on the rate of deterioration of the dope content of lubricating oil during use showed that with a normal rate of aeration about 20 percent of the lead is driven off as vapor in from 2 to 3 hours, and the remaining 80 percent remains for the following 20 hours. Even with foaming aeration extending over a 22-hour period, an appreciable proportion of the original quantity remained in the oil.

Journal-bearing lubrication experiments showed that at 40° C. the oil diminished in lubricating value with use. At 100° the lubricating value remained nearly unchanged, while at 150° a remarkable improvement was exhibited. The action of ethyl fluid in preventing the formation of carbonaceous products by oxidation and a consequent increase in fluid friction was shown by the fact that friction at 40° remained constant within the limits of experimental error over the 70-hour period of the trial.

Experiments on the effect of ethyl fluid on the oxidation of the oil used to lubricate the piston of a 2-stroke air-cooled engine resulted in superior performance which coincided with a reduction of the rate of oil consumption of 20 percent.

Bench trials of a 4-stroke engine, lubricated with plain oil and with the same oil plus 12 cc per gallon of ethyl fluid, showed that for both oils the optimum performance is reached after a running-in time of about 4 hours. The first permanent lubrication failure when using plain oil occurred after the engine had run for about 2 hours at the higher power output attained as a result of running-in, although the running was unstable at all times. Temporary lubrication failure occurred early in the running-in period, and the effect was always imminent. When the engine was lubricated with oil plus dope, the relatively higher output reached after the running-in period was maintained with little variation for nearly 10 hours, when the first lubrication failure occurred. The first lubrication failure in both trials was followed immediately by a partial recovery succeeded by a second failure, after which the engine continued to run for an indefinite period but at reduced power. A decided decrease of fuel economy and a similar increase of cylinder temperature are coincident with the first lubrication failure. The piston ring condition corresponded well with the performance of the engine. Thus the first permanent lubrication failure occurred with both oils when the condition of either ring fell below the sticking-at-one-spot state.

Present concepts of the relation of A.S.T.M. pour test to service requirements of oils, J. L. McCloud (In *Symposium on Motor Lubricants. Philadelphia: Amer. Soc. Testing Materials, 1933, pp. 27–37, figs. 2*).—This is a critical analysis of the findings of others from which the observation is drawn that the A.S.T.M. pour test is one of suitability, and that in any general type of oils it or some related test must be used in consideration of the service requirements of oils for internal-combustion motors.

Service changes in crankcase lubricating oils, M. A. Dietrich (In *Symposium on Motor Lubricants. Philadelphia: Amer. Soc. Testing Materials, 1933, pp. 57–76, figs. 11*).—The experimental data summarized in this contribution from Ohio State University indicate that used crank case oils generally show a marked decrease in viscosity, flash and fire points, and pour point because of dilution. A decided increase is noted in the carbon residue and ease of emulsification with water. The extent of change which these characteristics undergo bears no relation to the original characteristics of the oil. The presence of dilution appears to reduce the slope of the viscosity-temperature curves for those oils whose viscosity-temperature curves are steep.

The diluent consists of high boiling material possessing a considerable degree of unsaturation. Sludge formed in the oils consists mainly of carbonaceous material formed by cracking or partial combustion of either the lubricating oil or the fuel. The quantity of sludge formed cannot be related to the oxidation resistance or carbon residue of the oil but bears some relation to oil consumption. The quantity of ash-forming constituents is determined by the viscosity of the oil at the time of service, the length of service, and the characteristics of the engine. In Diesel engines the sulfur content of the sludge is fairly high and varies with the sulfur content of the fuel oil.

The distillation curves of oils used with normal quantities of make-up oil are not greatly different from those for the new oils unless the oils have a wide boiling range. The acidity of oils in use approaches a constant value which differs under varying conditions of service. A considerable portion of the acidity is volatile with the diluent and the quantity can be controlled by engine accessories. The iodine numbers of oils decrease slightly in service, but oils of high iodine numbers show no greater decrease than oils of low iodine numbers.

Oil volatility and viscosity at the time of service are the only characteristics which bear a relation to change in service.

It is concluded that changes in characteristics of crank case oils during service are dependent far more on the type of engine, its condition, and its manner of operation than upon the characteristics of the new oils as determined at present in the laboratory. The volatility of the oil as measured by the spread in the distillation range and the viscosity insofar as it is affected by dilution at the time of service are the only characteristics which appear to have some quantitative relationship to the changes which the oils undergo.

Rural installations.—I, Importance of satisfactory wiring and protective technique. II, Improvement of tough rubber wiring systems—farm equipment. III, Protective systems—fuses and circuit breakers—leakage. IV, Application of leakage protection methods, T. C. Gilbert (*Electrician [London], 110 (1933), Nos. 2871, pp. 730–732; 2872, pp. 792, 793; 2873, pp. 821, 822; 2874, pp. 850, 851*).—The problems encountered in rural electrification practice are discussed in the light of experience in the United States, Canada, and Germany.

With reference to the requirements of a suitable wiring system, it is contended that the tough rubber wiring system is the best for use in rural electrification. The use of a solid conductor insulated with vulcanized india rubber and a tough rubber outer coating is suggested.

The paper also deals with joints, branch switches, protection against dampness, and the like. With reference to protective systems, fuses are recommended with the use of two separate circuits, control of groups of lights by switch fuses, and protection of motors by circuit breakers.

A new leakage protective system used in Germany is described.

Electrically heated garden frames, E. A. Beavis (*Rural Electrif. and Electro-Farming, 9 (1933), No. 99, pp. 82–85, figs. 6*).—Brief information is given regarding a small inexpensive installation for the amateur gardener.

Forcing frames and seed beds: Soil heating by means of lead-covered resistance cables, E. A. Beavis (*Electrician [London], 110 (1933), No. 2865, pp. 552, 553, figs. 5*).—Experiments with a forcing frame using electricity to heat the soil are briefly reported.

The frame took the form of a brick pit 2.5 ft. deep having a ground surface area of approximately 7 by 5 ft. About 20 yd. of cable was used at a spacing of 7 in. There was a depth of soil of 6 in. which took nearly 2 days to reach its final temperature, and it was found that a maximum gradient of about 10° F. existed through this thickness of soil.

Results were obtained with runner beans, cabbage, turnips, onions, lettuce, radishes, parsnips, and beets. The growth of runner beans especially was greatly accelerated by the artificial heating.

Farm line construction, M. Eldredge (*Elect. World, 102 (1933), No. 9, pp. 268–272, figs. 3*).—Data are presented on cost of rural line construction and on cost-saving methods. It was found that 600-ft. spans on 30-ft. poles with copperweld conductors can be used satisfactorily and at a saving in costs. Data are given on details of design and costs.

Chart determines hauling costs and number of trucks required, R. D. Gladding (*Engin. News-Rec., 111 (1933), No. 7, p. 199, fig. 1*).—A brief mathematical analysis of truck hauling is presented, together with a diagram for determining cost of haul.

Spacing of row crops in the United States (*Agr. Engin., 14 (1933), No. 9, pp. 242, 244*).—This is a brief summary of the results of a questionnaire study made by the committee on row crop investigations of the American Society of Agricultural Engineers, in which data were obtained from 44 State agricultural experiment stations and 85 branch houses of leading farm implement manufacturers. The data relate to 23 crops, including both field and vegetable crops.

The data show that all crops are planted both on level ground and on ground that is ridged. This means that every State uses some of the special machinery for handling row crops planted on ridges or in furrows. For the cultivation of the crops, sweeps are listed by every State, and their sizes run from quite narrow widths up to 36 in. in width. Other methods of cultivating use the knife, disk, blade, duckfoot, spring tooth, scrape, scratch, and shovels of various kinds as follows: Double point, bull tongue, slip point, spearhead, twisted, and narrow shovels from 1 to 4 in. in width.

The most common spacing between the rows of the four most important crops grown is for corn, cotton, and grain sorghum 42 in., and for potatoes 36 in. The other row spacings vary from 10 in. for green peas to 240 in. in the case of some watermelon growers.

Cross-blocking sugar beets by machine, E. M. Mervine and A. W. Skuderna (*U.S. Dept. Agr. Leaflet 97 (1933), pp. 6, figs. 6*).—This leaflet describes the machine set-ups by which sugar beets may be satisfactorily blocked by machine.

Field studies made in cooperation with the Colorado Experiment Station and the University of California under a wide variety of soil and plant growth conditions and with several types of blocking machines showed definitely that mechanical blocking may be substituted for hand blocking with the hoe, provided initial stands are adequate and the work is carefully done so as to prevent injury to the stand.

In its simplest form a cross-blocking machine is an ordinary beet cultivator with cultivator tools so spaced that blocks of plants of the desired size and spacing are left undisturbed when the cultivator is drawn crosswise of the beet rows. Where no unusual conditions exist, knife weeders (knives) may be used for blocking. These should be so spaced on the tool bar that they will leave blocks of the desired size. A greater range of adjustment may be had by allowing the knives to overlap. It is desirable to have the knives staggered to make them self-cleaning and to throw soil toward the blocks rather than away from them. In extremely loose or trashy soil where knives have a tendency to push the soil and to tear small plants from their blocks, it is desirable to use disks. If the soil is in good tilth and free from trash, duckfeet will do good work. The blades of the duckfeet should be flat and hence lessen the danger of covering the beets in the blocks. Any one of several sizes of duckfeet may be used, depending on the type of soil to be cultivated.

A method is presented for improving the stand of cross-blocked beets.

Grain harvesting, L. W. Ries (*Getreideernte. Berlin: Paul Parey, 1933, pp. 61, figs.* [27]).—This is mainly a descriptive study of grain harvesting practices and machinery in Germany, including combining and cutting, binding, stacking, and threshing. Relative cost data are included.

Heat transfer thru stainless steel and glass-lined steel in dairy pasteurizers, J. C. Marquardt, W. D. Pheteplace, Jr., and A. C. Dahlberg (*New York State Sta. Tech. Bul. 211 (1933), pp. 25, figs. 11*).—A study is reported of the heat transfer values of two materials commonly used in the construction of pasteurizing vats. The heat transfer coefficients were correlated with metal, film, and milk temperatures as related to type and temperature of the heating medium and the rate of agitation.

Comparisons of the heat transfer coefficients were possible, as the tests of the two materials were made under like conditions. It was found that the heat transfer coefficients covered a wide range when the materials were used under different conditions. Heat transfer was more rapid through 18-8 alloy steel than through glass-lined steel when used as linings for vat pasteurizers. When water at 210° F. was used to heat milk, the coefficient of heat transfer for the steel was 91.7 and for glass-lined steel 73.2. Increasing the speed of the propellor agitator increased the heat transfer up to a certain speed, above which there was no increase but an actual decrease.

Water, skim milk, milk, and cream decreased the rate of heat transfer in the order given. The coefficient of heat transfer for water heated in 18-8 alloy steel was 15.7 greater than for milk, while in glass-lined steel the difference was 6.7. It is evident that water may be substituted for milk in testing pasteurizers for heat transfer if an allowance of approximately 10 to 20 percent is made, depending upon the rate of heat transfer. The coefficient of heat transfer for cream was 17.9 less than for milk in 18-8 alloy steel and 9.9 less in glass-lined steel.

The temperature of the film of milk within $\frac{1}{32}$ in. of the metal was usually within 3° of the temperature of the milk, even though the metal was from 20° to 40° hotter than the milk and the heating water was 210°. Increased agitation slightly decreased the spread in temperature between the milk film and the milk. Since the use of flowing steam as the heating medium did not increase the rate of heating, it is evident that flowing steam would not produce a hotter metal lining than did boiling water.

The rate of transfer of heat through a given metal varies markedly with the conditions under which the tests are conducted. For example, a coefficient of heat transfer of 181 was secured for 18-8 alloy steel in a vat of a different design.

A review of results of dielectric methods for measuring moisture present in materials, N. E. Edlefsen (*Agr. Engin., 14 (1933), No. 9, pp. 243, 244, figs. 6*).—In a brief contribution from the California Experiment Station, a discussion is presented of the findings of various investigators regarding dielectric methods of measuring the amount of water in grains, grain products, cotton bales, and soils. The effect of temperature and concentration of solution on the dielectric constant is also discussed.

Laboratory experiments were conducted by the author to determine whether the change in the dielectric constant due to a given increase in moisture content is the same for a comparatively dry soil as for a relatively wet soil. Samples of some results on sand ground to various degrees of fineness are presented graphically.

It was found that the slope of the curve relating moisture to change in condenser capacity was greater at low moisture contents. This means that a given quantity of water when distributed evenly through the soil produces a greater change in the dielectric constant of comparatively dry soil than it does in the same soil when relatively wet. However, up to the moisture equivalent the relation is practically linear. With dry loam soil the linear relation holds also, indicating that the increase in capacity of the condenser is proportional to the water added to the soil. Results with undisturbed clay loam soil in the field also indicated a straight line relation between moisture content and change in condenser capacity.

Notes on the spontaneous combustion or ignition of hay, F. R. Dodd (*Analyst, 58 (1933), No. 683, pp. 77–80*).—This paper relates briefly the author's experience in determining the cause of hay fires, with particular reference to the detection of spontaneous combustion. Some data from hay tests of this character are briefly presented.

Farm building plans, J. C. Wooley and R. W. Oberlin (*Missouri Agr. Col. Ext. Circ. 305 (1933), pp. 20, figs. 26*).—Working drawings for several different types of farm buildings are presented.

A list of farm building plans for North Carolina farms, D. S. Weaver (*North Carolina Sta. Agron. Inform. Circ. 80 (1933), pp. [1]+6*).—This list includes plans which are available for distribution.

Rammed earth walls for farm buildings, R. L. Patty and L. W. Minium (*South Dakota Sta. Bul. 277 (1933), pp. 67, figs. 40*).—Studies are reported the purpose of which was to learn the characteristics of soils favorable to rammed earth construction and to determine the optimum clay and sand ratio and the optimum moisture content for both strength and weathering resistance in rammed earth walls. Studies also were made on protective coverings, on the effect of adding fiber to the dirt, on rammers and the proper ramming of dirt into the forms, on reinforcing for wall openings and corners, and on the best practices in building walls of this material. Finally a study of the cost and economy of rammed earth walls and their relative insulating value in the control of frost deposit when used for housing livestock was conducted.

The strength tests in compression were made to determine the relative value of certain soil characteristics for building practices. Samples of soils from all parts of South Dakota were analyzed and tested both for strength and for resistance to weathering. These soils were taken from 18 counties of the State covering the extreme territories. All test blocks were cubical in shape and were 9 by 9 by approximately 9 in. They were about as heavy as can be conveniently handled, weighing from 45 to 60 lb. when first made, depending upon the amount of sand in the dirt. They were rammed in forms with hand rammers and handled on board trays 12 in. square. The test beams for the reinforcing study were 36 by 12 by approximately 7.75 in. in depth. They weighed from 250 to 260 lb. and were handled on slat trays approximately 10 by 48 in.

It was found that rammed earth walls are an excellent insulating material, making an exceedingly warm wall in cold weather and a cool wall in hot summer. Rammed earth construction lends itself well to the construction of simple buildings with few wall openings.

The speed of construction should average approximately 2 cu. ft. of wall per man hour after experience is gained in handling and moving the forms. Mechanical rammers driven by compressed air may average 7 cu. ft. of wall per hour.

The best sand content in the soil used was found to range between 30 and 70 percent, although there are soils outside this range that are quite satisfactory. The sandy soils resist shrinking and checking, ram more easily, require less moisture, and generally weather better. Rammed earth construction can be carried on in a season when moderate freezing weather may be expected, but it is not a desirable practice. Screening the dirt for rammed earth work is not usually necessary. Deep concrete foundations are unnecessary for low rammed earth walls, although the foundation should be strong, as wide as the wall, and extend at least 12 in. above the ground. Some coarse aggregate seems desirable in the dirt used and in sizes up to 2 in., but this gravel should be well graduated and not all of the same size. Fibrous materials such as grass, fine roots, and straw increase the strength of rammed earth in compression, but they are unnecessary for low walls at least and interfere with the painting of the surface.

Protective coverings are highly desirable if not absolutely necessary for a rammed earth wall. The wall should last as long as the covering is kept in repair, and such a wall is superior to others in many ways. Adding hydrated lime to the soil reduced the strength materially and made the wall crumbly. Steel reinforcing rods were found to be the best reinforcing material tried in rammed earth construction.

Ordinary house paint is possibly the most practical covering for rammed earth walls. The best time to apply the first coat is during construction and about 5 days after the forms are removed from the section to be painted. The priming coat may be of raw linseed oil or an ordinary priming coat of paint. Plaster or stucco makes a good substantial covering but should not be applied until the wall has gone through the shrinking period. This will take at least 10 days after the wall is rammed if the weather is dry.

A comparison of temperature records in a rammed earth house with other similar poultry houses during the month of February 1933 (which was an exceptionally cold month) showed it to be 3.45° F. warmer in the earth house in early morning. At 1 p.m. the frame house averaged 2.11° warmer than the earth house. This made the fluctuation of temperatures in the earth house less than in the frame house by 5.56° during the day.

Data for design of retaining walls, A. H. T. Williams (*Concrete [Chicago], Cement Mill Ed., 41 (1933), No. 9, p. 10, fig. 1*).—These data are presented in consolidated form by means of charts, graphs, and formulas.

Leaky brick walls and how to prevent them, J. H. Mallon (*Architect. Rec., 72 (1932), No. 6, pp. 412–416, 32, 34, figs. 4*).—Experiments with 8 different kinds of brick and 6 different mortars built into small reservoirs to test watertightness are reported.

It was found that water does not soak through the brick or through the mortar, but enters through openings and cracks between the brick and mortar where a close bond does not exist. No particular type of mortar caused leaky walls. In every case all mortars gave identical results when used with the same brick.

The conclusion is drawn that the most frequent cause of leaky walls is poor workmanship, resulting in insufficient mortar in the wall, especially in the head joints. The importance also is emphasized of designing a structure so that water will not concentrate against any part of the wall. One of the best precautions is to select the proper type of mortar joint. A tooled finish, preferably concave or V-shaped, is strongly recommended.

It also seems desirable to avoid extremes of high or low absorptive power in the brick. Mortar should be plastic, so it will spread out evenly, permitting a more complete bedding of the brick and an increased area of contact between the surface of the brick and the mortar, and so that the longitudinal joints which parallel the face of the wall will be completely filled when mortar is slushed into them.

On the thermal conductivity of various insulators at room temperature, C. D. Niven (*Canad. Jour. Res., 9 (1933), No. 2, pp. 146–152, figs. 2*).—In a contribution from the National Research Laboratories at Ottawa, Canada, the values for thermal conductivity of various common materials chiefly used in the walls of houses are given. By plotting the results obtained, as well as those obtained by other experimenters, on a density-conductivity diagram there is a general indication that at higher densities thermal conductivity increases with increase of density much more rapidly than it does at low densities.

Nightly cooling of rooms after cutting off heat and the minimum heat storage of walls [trans. title], I. S. Cammerer (*Gsndhts. Ingen., 56 (1933), No. 7, pp. 73–75, figs. 2*).—The various effects of the heat storage capacity of walls are discussed, and the results of experiments are reported graphically showing the cooling of a series of common wall types.

The conclusion was drawn that the specification of a minimum heat loss through walls is unnecessary so long as the walls are of good solid construction. However, it is considered necessary to adapt the means of heating to the type of wall selected.

Tests of laminated bent rafters, II, H. Giese and E. F. Clark (*Agr. Engin., 14 (1933), No. 9, pp. 248–251, 255, figs. 4*).—This is the second contribution to this subject by the Iowa Experiment Station (E.S.R., 67, p. 324).

The tests reported were carried on to determine the quality of the glued joints after the lapse of a year. The specimens were stored on the concrete floor of an unheated building and under a leaky roof, and consequently subjected to rather severe humid conditions. All comparisons of stiffness made in the conclusions are for a deflection difference of 0.26 in. at the center of a 4-ft. gage length.

It was found that beams constructed of five 1 by 4's averaged 1.27 times as stiff as a rafter of the same construction not bolted. Glued beams composed of six 1 by 3's were 4.52 times as stiff as one not glued of the same construction. Glued beams composed of five 1 by 4's bolted and glued were 4.65 times as stiff as one of the same construction not glued. Glued beams composed of five 1 by 4's glued with no bolts are 6.20 times as stiff as an unglued rafter of the same type. The use of bolts is more important in the construction of unglued beams than glued beams, except that they do improve the glue joint. The fact that the glued specimens compared favorably in stiffness with the solid specimens in both series of tests indicates that moisture had little effect on the water-resistant glue.

Comparing these conclusions with the conclusions of last year's tests, the stiffness of the glued and solid specimens was not affected as much by the change in moisture content as the unglued specimens.

Since a fracture usually occurred on the extreme fiber, it is important that the best materials be used on the outer lamination. The lower grade materials may be used in intermediate laminations. The average maximum unit shear at failure was higher for the laminated glued beams of five 1 by 4's than for the beams of six 1 by 3's. Shear was the determining factor in the bending strength in the laminated glued beams constructed of six 1 by 3's, whereas stress on the extreme fiber accounted for the largest number of failures in the beams of five 1 by 4's. The horizontal shearing strength of glue compares favorably to gluing specifications, despite the fact that it was applied to a little more than one half the width of the board and the laminations were nailed together without the use of clamps.

The pig farm: Accommodation and equipment, L. A. Downey (*Brisbane: Queensland Dept. Agr. and Stock, 1932, pp. 25, figs. 25*).—Practical information is given from the Australian viewpoint on hog houses and equipment, including fences, feeding and watering devices, crates, and the like.

Comparison of a trench silo with an upright silo, J. R. Dawson and A. G. Van Horn (*U.S. Dept. Agr. Circ. 274 (1933), pp. 16, figs. 4*).—Tests conducted at the U.S. Dairy Experiment Station at Woodward, Okla., for two seasons by the Bureau of Dairy Industry in cooperation with the Oklahoma Agricultural and Mechanical College to determine the relative merits of the trench and the upright silo are reported. The trench silo used was 71 ft. long, 6 ft. 9 in. deep, 14 ft. wide at the ground level, and 10 ft. wide at the bottom. At each end of the trench the bottom sloped upward, forming a gradual incline to the ground level. The capacity of the trench was approximately 4,460 cu. ft. The upright silo used was of tile-block construction and was 14 ft. in diameter and 22 ft. deep. It was of the semipit type, having 11 ft. of its depth below and 11 ft. above the ground level.

The cost of constructing the trench silo was $1.78 per 100 cu. ft. of capacity, practically all of which was for team and man labor. The original cost of material and construction of the upright silo was $10.82 per 100 cu. ft. of volume.

The upright silo was found markedly superior to the trench silo in preserving silage. On the basis of the average losses during the two years' experiment it may be expected that 78 out of every 100 tons of material placed in the trench silo can be recovered as edible silage, and 9.2 tons of the 22-ton loss will be the result of spoilage. In the upright silo, 88 tons out of every 100 tons of material ensiled can be recovered as edible silage, and 6.5 tons of the 12-ton loss will be the result of spoilage. The spoiled silage in the trench silo was largely along the walls of the trench. The quality of edible silage from both silos was excellent.

The average weight of a cubic foot of silage under the conditions of the experiment was 29.6 lb. for the trench silo and 34.5 lb. for the upright silo. The moisture content of the silage was practically the same for both silos. The weight per cubic foot of silage from the trench silo was considerably lower than similar weights for corn and kafir silage at other experiment stations.

The total cost of placing the crops in the silos from the cutter and removing the silage from the silos was $1.13 per ton of edible silage for the trench and $0.44 for the upright silo. However, the location of the trench and the methods and equipment employed will materially affect these costs. The cost of covering the silage and removing the cover from the trench is excessive, and is probably the most significant item of expense in trench silo operation.

A layer of straw together with from 12 to 16 in. of soil as a covering is more efficient in preserving the silage than is straw alone.

The straw-loft poultry house, E. G. Johnson and H. H. Alp (*Illinois Sta. Circ. 412 (1933), folder, figs. 6*).—Practical information on construction is given together with working drawings and a bill of materials for a 20 by 20 ft. house.

Thermal insulation, E. Griffiths (*Jour. Roy. Soc. Arts, 81 (1933), No. 4214, pp. 911–926, figs. 2*).—A survey of methods of insulating refrigerating and cold storage equipment is presented.

Thermal insulation, E. Griffiths (*Jour. Roy. Soc. Arts, 81 (1933), No. 4215, pp. 930–943, figs. 8*).—This is the second of a series which deals largely with the technic and methodology for measuring thermal conductivity of various insulating materials, including furnace insulation, bricks, and soils.

AGRICULTURAL ECONOMICS

The law of diminishing returns in agriculture, P. E. McNall (*Jour. Agr. Res. [U.S.], 47 (1933), No. 3, pp. 167–178, fig. 1*).—A number of experiments, chiefly on the effect on growth or yield of plants of added increments of fertilizing elements, sunlight, and water, and the statements of the law of diminishing increments by different investigators, are reviewed by the Wisconsin Experiment Station.

The curve which best fits the ratios of increasing outputs to additional inputs is of logarithmic form and as such lends itself to algebraic expression Experimental evidence was not found to support the mathematical deduction that the ratios of output to input, when two or more input factors are varied simultaneously, result in a sigmoid curve.

[Investigations in agricultural economics at the Kentucky Station, 1932] (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 7–12, 13–19*).—Results of investigations not previously noted are reported on as to the receipts, expenses, and net income on Kentucky farms; farm real estate taxation; economic and social studies in submarginal agricultural areas; agricultural credit and finance in Kentucky, in addition to previous work (E.S.R., 68, p. 392); factors affecting prices of different types of tobacco; cost and profit margins in livestock production; and the economics of hog production.

[Investigations in agricultural economics at the Missouri Station, 1931–32] (*Missouri Sta. Bul. 328 (1933), pp. 23, 24*).—Results of investigations not previously noted are briefly reported on labor incomes for 140 farms in northwest Missouri, by O. R. Johnson and E. E. McLean; cost data for 69 farm poultry flocks, by Johnson and B. H. Frame; cost of family living on the farm in 1927–30, by Frame; the relation of farm improvements to earnings and value of farm land on 110 Linn County farms, by Johnson and J. C. Wooley; grades and prices of eggs in 1931, by F. L. Thomsen; and farm property tax indexes for Missouri for the years 1914, 1928, and 1929, by C. H. Hammar.

Current farm economics, Oklahoma, [October 1933] (*Oklahoma Sta., Cur. Farm Econ., 6 (1933), No. 5, pp. 109–124, figs. 4*).—Included are (1) brief discussions of the general agricultural situation and the cotton situation, by L. S. Ellis, of the wheat and dairy situation, by P. H. Stephens, and of the sheep and wool situation, by R. A. Ballinger; (2) a brief article on Cooperative Marketing and Purchasing by Oklahoma Farmers, by Ballinger; and (3) a brief summarization of the results of a study of the Economic Conditions on 562 Oklahoma Wheat Farms in 1933, by O. D. Duncan and H. E. Woodson.

[Investigations in agricultural economics at the Texas Station, 1932] (*Texas Sta. Rpt. 1932, pp. 79–83*).—Brief general statements of results not previously noted are given for the following studies: (1) The organization and management of farms in the High Plains cotton area of the State, made by C. A. Bonnen in cooperation with the Bureau of Agricultural Economics, U.S.D.A.; (2) range management in the Edwards Plateau grazing area, made by Bonnen in cooperation with the Texas Extension Service and the Bureaus of Animal Industry and Agricultural Economics, U.S.D.A.; (3) local cotton marketing, made by L. P. Gabbard and W. E. Paulson in cooperation with the Bureau of Agricultural Economics, U.S.D.A.; (4) mixed car lot movement as a factor in the economic distribution of lower Rio Grande Valley fruits and vegetables, by Paulson; (5) quality as a factor in the marketing of vegetables in the lower Rio Grande Valley, by Paulson; and (6) central and local market prices of wheat in relation to quality, made by Paulson, G. S. Fraps, and R. T. Stewart in cooperation with the School of Agriculture, Agricultural and Mechanical College of Texas.

Twenty years of Ohio agriculture, 1910–1930, J. I. Falconer (*Ohio Sta. Bul. 526 (1933), pp. 110, figs. 53*).—The tables, maps, and text deal with the growth of population and industry, transportation, farm machinery, prices and income, agricultural education and organization, farm life, land in farms and volume of production, farm real-estate values, number and size of farms, farms operated by tenants, some farm cash expenditures in 1929, different crops, fruits, vegetables, flowers, plants, greenhouse and nursery products, maple sirup, different kinds of livestock, and poultry.

"The period from 1910 to 1930 was one of marked change in Ohio agriculture. Outstanding was the wide fluctuation in prices. By 1916 the World War was leading to higher prices. With the entry of this country into the war in the spring of 1917, prices jumped and continued on a level twice that of 1910–14 until 1920. The drastic fall in prices in the latter part of 1920 and in 1921 ushered in a new period of lower prices. This latter period was one of industrial prosperity but of relatively low income to agriculture, as expressed in the fact that farm land values continued to decline.

"In spite of the foregoing, however, there was widespread improvement and changes in farming. Farming became more commercialized. An expanding industrial population and improved transportation facilities gave better markets and led to the expansion of those types of farming usually found near cities. The substitution of the automobile, the truck, and the tractor for the horse greatly increased the cash expenses of farm operations but enabled the enlargement of the volume of business. Improved methods of breeding, growing, feeding, harvesting, and marketing were widely adopted. Probably no period has seen a greater advance in the facilities for farm life than that from 1910 to 1929."

Roughage production in New Hampshire, M. F. Abell (*New Hampshire Sta. Bul. 273 (1933), pp. 35, figs. 7*).—Analysis is made of data gathered from 81 farms for the crop year 1928 and 247 farms for the crop year 1929. Of these farms, 281 grew silage corn. The question of what roughage should be grown is discussed, with tables and charts considering such factors as yield per acre, ration for cattle, influence of corn in rotation on yield of hay, monthly distribution of labor with different combinations of forage crops, relation of length of hay rotation and yield of hay, cost of seeding permanent hay by different methods, etc. Suggested rotations of forage crops are given. Other tables are given and discussed dealing with labor requirements, operations, costs, etc., for silage and hay production. Some of the findings of the study follow:

An increase from 5 to 6.5 or 7 acres of silage permitted the addition of 5 cows to the herd without an increase in the total area in roughage. The 60 tons of silage that can be produced on 5 or 6 acres will release 12 to 13 acres from hay production. Silage production, by extending the period of roughage harvest and reducing the number of acres of hay needed, gives a better distribution of labor and reduces the peak labor load during hay harvest, thus making it possible to harvest roughage with a minimum of extra hired help. Use of permanent hay alone limits stock carrying capacity, creates difficult labor peaks, results in lower quality of hay, and increases management costs. The inclusion of some annual hay crop provides a more satisfactory roughage, a means of more frequent reseeding of permanent hay, a better quality of hay, and a longer harvest period, making it possible to use less hired labor. Of the most important annual hay crops, the cash expense was lowest for Hungarian millet and soybeans, somewhat higher for oats and vetch, and highest for oats and peas.

Silage required 64.2 man hours per acre or 5.5 hours per ton. The cash costs, omitting labor and machinery used, were $11.01 per acre and 94 c. per ton. Hay required 11.3 man hours per acre or 7.7 hours per ton. The cash cost was $1.99 per ton. On some farms labor-saving methods would have reduced the labor on silage 21.5 percent and on hay 26.7 percent.

Grape production costs and returns in southwestern Michigan, N. L. Partridge (*Michigan Sta. Spec. Bul. 242 (1933), pp. 20*).—Data covering one to three of the years 1927–29 were obtained for 40 vineyards, about 30 being studied each year. Some information was also obtained in 1931 regarding wages paid and prices of materials. The data for costs and returns for individual vineyards and groups of vineyards are analyzed and compared to show the effects of yields, method of marketing, types of soil, frosty vineyard sites, overhead costs, etc., upon costs of production and returns. Suggestions are made as to methods of reducing costs of production. Some of the findings and conclusions follow:

"With a downward price trend, the profit margin in grape production has practically vanished. Although the various items which enter into the cost of production such as overhead, labor, horse hire, machinery costs, and prices of other supplies are also decreasing, the decrease in sales value has been greater. . . . Unless the average annual production on the lighter soils is about 3 tons and on the loamy soils more than 4 tons per acre, it is unlikely that the unit cost of production can be kept low enough to permit the maintenance of the vineyard without considerable extra expense above the income. It seems probable that vineyards of low productivity should be removed to avoid losses of this sort. New plantings should be delayed until the future is more clear."

Factors influencing the cost of production of eggs and pullets in southern Arizona, H. Embleton and H. C. Morse (*Arizona Sta. Bul. 145 (1933), pp. 145–168, figs. 5*).—Analysis is made of the records for the year 1932 from 44 poultry farms in the vicinity of Tucson. Tables and charts are included showing the itemized expenses per farm, per hen, and per dozen eggs, and the itemized receipts per farm and per hen. Other tables are included and discussed showing the average costs per dozen of egg production of the farms grouped on the bases of egg production per bird, size of flock, number of birds cared for per man, and percentage of mortality in flocks. The influence of the variations in price received for eggs on net income per farm, the gross cost by items, receipts, net cost, and net cash cost of producing pullets, and the influence of the number of pullets raised and of the source of chicks on the cost of raising a pullet are also shown in tables and charts.

The average investment of capital was $1,174 per farm, or $1.97 per hen. The average cost of producing a dozen eggs was 25.1 c., and the average price received per dozen was 23.6 c. The cost per hen averaged $3.16 and the receipts $3. The average net cost of producing a pullet was 98.3 c. The cash costs were for eggs $2.23 per hen and for pullets 61.5 c. The cost per dozen eggs decreased as follows: From 52.4 c. with a production of 100 eggs or less per bird to 19.3 c. with a production of 161 or more eggs per bird, from 34.2 c. for flocks of 199 hens or less to 20.7 c. for flocks of 1,200 or more hens, and from 33.4 c. where a man cared for 899 or less birds to 21 c. where a man cared for 2,000 or more birds.

The cost of raising a pullet decreased from $1.20 where less than 200 were raised to 95 c. where 600 or more were raised. The cost was 88 c. for chicks hatched from eggs from the poultryman's own flock and $1.02 and $1.03, respectively, for those from chicks purchased within the State and from chicks purchased from other States.

Cooperation in Missouri agricultural adjustment (*Missouri Sta. Circ. 170 (1933), pp. 4, fig. 1*).—The three principal conditions giving rise to the present unsatisfactory prices of farm products are stated, and the ways in which farmers, the U.S.D.A. Agricultural Adjustment Administration, and the Missouri College of Agriculture can assist in the agricultural adjustment program are outlined.

Marketing potatoes in New Hampshire, E. H. RINEAR and M. F. ABELL (*New Hampshire Sta. Circ. 42 (1933), pp. 18*).—"The principal marketing problems discussed in this bulletin are distribution of supplies from out-of-State sources, potato prices in New Hampshire markets, obstacles preventing middlemen from purchasing local supplies, marketing methods, grading costs, storage costs, and advantages of selling the crop regularly."

Consumption of local-grown potatoes apparently has increased during the period 1922–32. The supply from out-of-State sources decreased. Grading costs averaged 6 c. per bushel with mechanical graders and 7 c. for hand grading. Grading and hauling to market averaged $8.50 per 100 bu. in the northern part of the State and about half as much in the southern part. Southern growers followed more direct marketing methods, received a higher price, and even with higher marketing costs received a greater net return per bushel. With potatoes valued at $2 per 100 lb., shrinkage, interest, and insurance totaled 15 c. per 100 lb. during a storage period of 150 days.

Variations in swine prices within Iowa, including a study in statistical procedure, T. W. SCHULTZ and A. G. BLACK (*Iowa Sta. Res. Bul. 161 (1933), pp. 177–215, figs. 7*).—The prices paid to Iowa producers for swine from October 1924 to September 1931, as shown by the monthly surveys of the Crop Reporting Board, U.S. Department of Agriculture, are analyzed to determine the variations between districts of the State and the interseasonal and intraseasonal variations between the districts. In some cases the State was divided into 12 districts, but throughout most of the study the State was divided into 4 nearly equal divisions. In solving some of the usual problems arising concerning the seasonal and secular changes in time series, the analysis of variance technic was used (E.S.R., 69, p. 611). The steps and calculations in applying this technic are given in detail.

The average annual hog prices per 100 lb., 1924–25 to 1930–31, were $9.44 in the northwest district of the State, $9.48 in the northeast district, $9.50 in the southwest district, and $9.68 in the southeast district. The price differentials between the southeast district and the other three districts, especially in the northwest district, varied widely from year to year. The intraseasonal differentials among the northwest, northeast, and southwest districts did not vary significantly. In contrast the prices in the southeast district stood from 10 to

20 c. above those in the other districts from November to June, and from July to October the differentials widened sharply in favor of the southeast district.

Proposed revised Federal grain standards (*U.S. Dept. Agr., Misc. Pub. 173 (1933), pp. 159*).—"This report has been prepared for the primary purpose of summarizing and presenting for public consideration the studies made by the Bureau of Agricultural Economics in recent years with reference to the possibilities for improving the standards for wheat, rye, corn, oats, feed oats, mixed feed oats, barley, and grain sorghums that have been promulgated at various times since 1916 under the provisions of the Grain Standards Act, and with reference to the desirability of establishing new standards for mixed grain. . . . This report is presented in two parts. The first part comprises a complete set of proposed, revised, grain standards, accompanied by proposed regulations for the certification of important information about grain quality that would supplement grade designations and that would be noted on certificates under Remarks. The second part consists of explanatory matter which deals largely with those proposed additions to and revisions of the present grain standards that are of major importance, and which discusses the objectives sought."

Crops and Markets, [September 1933] (*U.S. Dept. Agr., Crops and Markets, 10 (1933), No. 9, pp. 329–368, figs. 3*).—Tables, reports, summaries, estimates, etc., of the usual types and the summer cattle outlook (August 1933) report are included.

RURAL SOCIOLOGY

[Rural sociology studies in Missouri] (*Missouri Sta. Bul. 328 (1933), pp. 36, 37*).—Findings are briefly noted from case studies of 59 farming families in Boone County receiving poor relief from county funds, by E. L. Morgan and H. J. Burt; a restudy of population groups in Boone County (E.S.R., 54, p. 287) by Burt; and population movements in the State, by Morgan and Burt.

Land utilization as a basis of rural economic organization, C. F. Clayton and L. J. Peet (*Vermont Sta. Bul. 357 (1933), pp. 144, pls. 15, figs. 10*).—This bulletin is based on a study made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., of land utilization and related problems in 13 hill towns of Vermont, in which migration induced by changed economic conditions has greatly reduced the population. The climate and rainfall, soils, natural resources, trends in population, number of farms, and farm acreage, markets, classes of land, shifts in the use of land, and the relation of location, soil classes, and important sources of farm income to the number and status of farms are described. Based largely on data gathered from 161 farms, the composition, mobility, education and experience, and the types and places of employment of the population, the classification of acreage in the farms, the land characteristics and use, and the utilization of crop, pasture, and woodland are discussed.

Tables are given and discussed showing for 159 farms in 1929, grouped by principal sources of income and by number of dairy cows kept, the actual and adjusted acreages per farm in crop land, open pasture, and woodland; income direct from the farm, from labor and machine work off the farm, and from pensions, gratuities, etc.; the percentage of gross income direct from crops, livestock, sugar and sirup, lumber and wood, etc.; cash receipts from different sources; cash expenses for different purposes; savings and investments; value of family living furnished by the farm and purchased; and other factors.

The sources and amounts of revenue in the towns, the town expenditures for different purposes, town indebtedness and tax delinquency, and farming and forestry as sources of public and private income are discussed.

"The data presented in this bulletin show that the major types of land use that are feasible in the 13 towns are farming, forestry, and recreation."

Migration of agricultural wealth by inheritance, two Ohio counties, E. D. Tetreau (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 65 (1933), pp. [1]+15*).—This study deals with wealth migration, a subject which has hitherto received relatively little attention, as compared with population migration.

Incomes and cost of living of farm families in North Dakota, 1923–1931, E. A. Willson (*North Dakota Sta. Bul. 271 (1933), pp. 31, figs. 5*).—This publication, reporting studies made in cooperation with the U.S.D.A. Bureau of Agricultural Economics, is the first dealing with the cost of living of North Dakota farm families. The data were obtained by analysis of about 300 farm account records.

Fluctuating crop yields and changing prices caused rather wide variation in the average annual income of farm families during the nine years covered in this study. A direct relationship was found between cash income and size of farm, but no relationship between cash income and amount of borrowings. A fairly direct relationship was found between income and expenditures for farm operations, farm automobile, farm investments, principal payments on borrowings, interest, and family living.

Better living competes with investments for any spendable income above necessary farm and family living expenses. The standard of living of farm families is affected by marked changes in income, but is more stable, less subject to change, than income. Changes in family living expenditures tend to lag one year behind marked changes in incomes.

Farm families in the eastern and central States produce a larger percentage of the value of their living from the farm than North Dakota farmers, but at least a part of the difference is due to price differentials in the two areas. The standard of living is influenced by choice as well as by income and the cost of family living. Families with small incomes and low living cost may spend more for the worth-while values of life than families with large incomes and high living costs. The standard of living of North Dakota families has undoubtedly declined as a result of the decrease in incomes since 1928. A marked increase in incomes through higher prices for farm products will be necessary to prevent a further decline in living standards.

The income, savings, and work of boys and girls on farms in New York, 1930, H. W. Beers (*New York Cornell Sta. Bul. 560 (1933), pp. 36, fig. 1*).—This study, conducted in cooperation with the U.S.D.A. Bureau of Agricultural Economics, is an extension of a former study of the income and work of boys on New York dairy farms in one section of the State (E.S.R., 64, p. 387). A representative sample was gathered from all parts of the State, including girls as well as boys.

The study reveals no new farm problem, nor is it directly concerned with the old problem of how to keep boys, or girls, on the farm. It offers some newly organized information, however, pertinent to the development and socialization of farm youth. It submits descriptions of money income, savings, property, work, and extension influences in the hope that rural leaders can incorporate these findings into the fund which serves as their basis for outlining programs of rural development.

The concern of Ohio agriculture in a system of old age relief, C. E. Lively (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 64 (1933), pp. 23, figs. 3*).—The purpose of this study is to present, largely by means of a population analysis, certain of the circumstances that must be considered in arriving at an intelligent opinion of old age relief.

The growth and decline of South Dakota trade centers, 1901–1933, P. H. LANDIS (*South Dakota Sta. Bul. 279 (1933), pp. 38, figs. 10*).—The author finds some interesting relationships between means of transportation and communication and the growth or decline of trade centers. Between 1901 and 1912, when more than 1,200 miles of railroad were built, many new trade centers developed along these new railroad lines.

Decline in trade centers seems to have been associated with increase in number of automobiles, the development of the newspaper, the invention and rapid diffusion of the radio, and the establishment of rural mail routes and parcel post.

Modern means of transportation made it possible for some trade centers to gain an advantage over others by the development of a variety of attractive social institutions, such as moving pictures, swimming pools, community organizations that recognize rural leadership and attempt rural cooperation, schools—high schools especially, churches, fairs, and similar institutions.

The author calls attention to the uniformity of local and national trends, citing Minnesota and Louisiana for comparison to South Dakota and elaborates upon the factors involved, including surfaced roads and year-round use of the automobile, the high price of farm products during the war and the post-war period, the depression, and chain stores.

The future of the small trade center is indicated as problematical. Its mortality will probably be much greater than that of larger trade centers, and those located on railroads have greater possibility of surviving and growing than when located away from a railroad. The evidence is that South Dakota will possess relatively fewer small trade centers than it possessed previous to the coming of the automobile. Gradually the small trade center is losing many of its functions, but retaining largely those types of business enterprises which deal in practical and necessary merchandise such as work clothing, staple food, and gasoline. Dress clothing and furniture, as well as luxuries, are monopolized by the larger centers.

It is noteworthy that between 1900 and 1933 trends toward growth have affected large and small centers in the same way and to about the same degree. Of those trade centers which have succeeded in surviving, the smaller trade centers have declined no more radically than the larger centers. However, a much lower proportion of the small centers survive in crisis periods.

Community and neighborhood groupings in Knott County (*Kentucky Sta. Rpt. 1932, pt. 1, p. 12*).—The findings in this study are briefly summarized.

FOODS—HUMAN NUTRITION

Food and the principles of dietetics, R. HUTCHISON and V. H. MOTTRAM (*London: Edward Arnold & Co., 1933, 7. ed., pp. XVI+630, pls. 3, figs. 33*).—The most important changes in this revision of this well-known volume, earlier editions of which have been noted (E.S.R., 53, p. 456), are in the first three chapters on the nature, nutritive constituents, and relative values of foods; the amount of food required in health; and the influence of various conditions upon the amount of food required. These chapters have been practically rewritten by the junior author. Numerous alterations have also been made in nearly every chapter.

Principles of fruit preservation, T. N. MORRIS (*London: Chapman & Hall, 1933, pp. XIII+239, figs. 36*).—This volume, which is one of a series of monographs on applied chemistry edited by E. H. Tripp, deals with the scientific principles and control of the various processes involved in the manufacture of jams and fruit jellies and fruit canning and drying. An introductory section is devoted to the composition of fruits, especially in regard to their content of acids, sugars, and pectins.

In the section on jams and jellies which follows, the peptic substances of plants and the pectin-sugar-acid gel are discussed at length with hitherto unpublished work on the subject by W. G. Ogg. Various methods of preserving fruits for jam making and canning out of season are described, and an account is given of the chemical control of jam manufacture.

In the section on fruit canning, the general account of the processes is followed by a chapter on spoilage, with particular attention to the problems of can corrosion. Chapters on standardization and examination of canned fruits and fruit bottling complete this section.

In the section on fruit drying, recent research on sun drying and artificial dehydration in various countries is discussed, together with problems connected with the storage and packing of dried fruits. A final section consists of chapters dealing, respectively, with discoloration in fruit products and the effects of various manufacturing processes on the vitamins in fruits.

Each chapter contains numerous references to the literature.

The thirty-seventh report on food products and the twenty-fifth report on drug products, 1932, E. M. Bailey et al. (*Connecticut State Sta. Bul. 354 (1933), pp. 757–821+XLIX*).—Of particular interest in this annual report of routine analyses of foods and drugs (E.S.R., 68, p. 271) is the report of the inspection of fruits and vegetables for evidence of excessive amounts of arsenical spray residues. Of 153 samples of apples taken in the market and from orchards, only 14 contained arsenic in excess of the accepted tolerance of 1.4 p.p.m. The highest amount found was 3.8 p.p.m. Of the other materials tested, one out of 37 samples of string beans contained arsenic in amounts slightly above the tolerance. None of the 6 official samples of cabbage contained excessive amounts, but in 1 sample examined for a local grower the outer leaves carried an excessive amount. Three samples of cauliflower showed no excess, but 1 sample representing stock seized by a Federal inspector carried a large residue of arsenic. One sample of lima beans gave negative results. It is noted that spray residue on fruits and vegetables has not presented a serious problem in the State, but that it is proposed to avoid late applications of spray materials and to avoid the use of lead-containing spray materials as far as possible to reduce still further the likelihood of dangerous excesses of injurious residues.

The report contains a discussion of health claims in food advertising, with an account of the development and functions of the committee on foods of the American Medical Association, and a copy of the general decisions which have thus far been adopted by the committee for the guidance of its members and the reference of food manufacturers and others interested.

[Methods of cooking beef] (*Missouri Sta. Bul. 328 (1933), p. 32*).—This progress report (E.S.R., 67, p. 473) summarizes studies on the effects of different oven temperatures for broiling steaks, by J. A. Cline and M. E. Swanson and on cooking beef roasts by Cline and R. Foster, with recommendations to the housewife for both processes.

Nutritive properties in meat, A. G. Hogan and W. S. Ritchie (*Missouri Sta. Bul. 328 (1933), pp. 30, 31*).—This is a brief progress report (E.S.R., 67, p. 474) upon the adequacy for several generations of rats of muscle meat, liver, and kidney as the sole source of protein.

Heat flow through bakery products.—I, Time-temperature relationships existing during the baking of bread, L. E. Stout and F. Drosten (*Indus. and Engin. Chem., 25 (1933), No. 4, pp. 428–430, figs. 3*).—Time-temperature data are reported for standard loaves of bread baked to a proper doneness of the interior in ovens at high (240° to 250° C.), low (200° to 210°), and moderate (215° to 230°) temperatures. The loaves were prepared from the formula flour 100, water 50, and yeast, salt, milk powder, and malt 1.56 parts each. The dough, 1½ lb., was allowed to rise for 50 minutes at room temperature, punched, allowed to stand 15 minutes at the same temperature, and then made up in standard individual pans 9 by 4 by 3 in., with thermometers or thermocouples inserted in various places within the dough. After proofing had reached 80 percent (of the baked volume), the bread was baked at the temperatures stated in 2-burner modified household ovens fitted with steam injectors to give good crusts. The doneness of the loaves was determined by an experienced baker.

The time-temperature curves showed in all cases three general periods. During the first 10 minutes there was a rapid rise of temperature within the loaf which was more marked in the ovens of high than of low temperature. This was followed by another 10 minutes in which the temperature rose at a slower rate, and finally there was a period of from 9 to 12 minutes of constant temperature. The two extremes of oven temperature did not produce good loaves. In no case did the temperature within the loaf exceed 100° or 101°. Under the experimental conditions this temperature must have been maintained for at least a period of 9 minutes to produce a loaf of satisfactory doneness.

[**Sweetpotato sirup**], W. H. MacIntire (*Tennessee Sta. Rpt. 1932, p. 25*).—Data are given on the composition of a sirup of good flavor made from the sweetpotato.

Fig-products investigations, H. M. Reed (*Texas Sta. Rpt. 1932, pp. 135, 136*).—This progress report describes new methods which have been developed for canning Magnolia figs and for preparing candied figs. The results are also reported of tests to determine the best concentration of sulfur dioxide solution to keep figs for shipment and the most favorable condition of ripeness and of temperature for the dehydration of figs.

A new maple product, R. W. Smith, Jr. (*Vermont Sta. Bul. 364 (1933), pp. 8*).—The maple product described, which is said to be "readily made and even more readily eaten", is prepared from pure maple sugar and pure cream of high fat content in a manner similar to that described in Illinois Station Bulletin 387 (E.S.R., 68, p. 854) for honey-cream.

The various steps in the experimental procedure to determine the best forms of maple products to use, the most satisfactory content of the cream, the most desirable proportions of sugar and cream, and the most favorable temperature are outlined with the results in each trial. The most satisfactory product was secured with pure maple sugar (preferably of a dark color) rather than sirup, cream of a fat content between 68 and 75 percent, and a mixing temperature of about 90° F. Cream of the high fat content required can be obtained by the use of the special De Laval Home Dairy Spread tinware recommended for the preparation of honey-cream, or by cutting down the rate of inflow of the milk in any separator. The crushed sugar is mixed with the warm cream with sufficient stirring to dissolve the sugar completely. The mixture is then poured into jelly jars or any convenient containers and placed in a refrigerator until hardened.

The mixture, which must be kept in a cool place, is recommended for shortening purposes, in candy making, as a sandwich spread, and for serving on waffles.

Wheat, egg, or milk free diets, with recipes and food lists, R. M. Balyeat, E. M. Rusten, and R. Bowen (*Philadelphia and London: J. B. Lippincott Co., 1933, pp. XI+[156], pl. 1, figs. 10*).—This volume, which has been prepared to assist physicians and dietitians in the selection of food lists and menus for patients sensitive to wheat, eggs, or milk, contains a discussion of the role played by food in various allergic diseases and methods of testing for food sensitization; lists of foods which can be used or which should be avoided by patients sensitive to wheat, eggs, and milk, separately and combined; recipes; and tables of food values, special diets, and height and weight standards. The chapter on suggested recipes contains a useful indicator giving the pages in which recipes in various combinations are to be found under the usual types of foods, thus making the task of finding recipes for a particular food allergy relatively simple.

High carbohydrate and high fat diets, E. M. Greisheimer, E. Goldsworthy, and G. Thomas (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1426–1428*).—The effect of various diets on glucose tolerance and on some of the constituents of the blood was studied by a series of 7-day feeding experiments on a single subject, with frequent determinations of glucose tolerance, inorganic phosphate, calcium, total nonprotein nitrogen, urea nitrogen, blood sugar, hemoglobin, red count, and white count.

The glucose tolerance was not significantly altered by a very high carbohydrate intake, but after 7 days on a high fat diet the response was typical of diabetes mellitus, the tolerance rapidly returning to the usual type after return to the balanced diet. Marked variations occurred in total nonprotein nitrogen, urea nitrogen, and sugar, but only slight variations in inorganic phosphate and serum calcium. The fasting blood sugar was remarkably constant on a balanced diet, but dropped to a fairly low level on the high fat diet.

The effect of banana powder feeding on the fecal flora of infants, B. S. Kahn (*Arch. Ped., 50 (1933), No. 5, pp. 330–335*).—The introduction by Haas (E.S.R., 66, p. 192) of banana powder in the treatment of celiac disease in infants led to this study of the mechanism of its action. In 7 normal infants between the ages of 2 and 3 months, the substitution in a two-thirds milk mixture of 5 percent banana powder for 5 percent cane sugar was followed in from 20 to 35 days by a change in the intestinal flora from an almost complete Gram-negative to an almost complete Gram-positive state. In one infant on the same milk mixture with the substitution of a 5 percent mixture of equal parts of sucrose and fructose for sucrose alone, the fecal flora changed in 20 days to an almost pure *Micrococcus ovalis*, the organism predominant in the fecal flora of the group receiving banana powder.

The author concludes that the fructose in the banana powder is responsible for the change in fecal flora and states that banana powder is a comparatively inexpensive source of fructose.

Effect of peptic digestion in vitro of artificial feeding as used for American infants, A. Lautz (*Amer. Jour. Diseases Children, 45 (1933), No. 5, pp. 985–994*).—In this study of the effect of various modifications of cow's milk on peptic digestion in vitro diluted feedings were used, with conditions established near the optimum for peptic activity. The extent of digestion was calculated from the increase in amino nitrogen resulting from the digestion. The materials tested included dilutions of raw milk, heat-treated milk with and without carbohydrates, acids, alkalies, and miscellaneous additions. Whey, protein milk, and high fat milk dilutions were also tested.

The peptic digestion was not affected to a marked extent by dilution and heating with and without concentration or by the addition of egg yolk or acids; was depressed by the carbohydrate additions which definitely thickened the mixtures, by increased fat content, by increased proportions of lactalbumin to casein, and by the addition of gelatin and alkalies; and was increased by increased proportions of casein to lactalbumin.

Action of copper and other elements in iron metabolism, E. Muntwyler and R. F. Hanzal (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 7, pp. 845, 846*).—Following the method described by Hanzal on page 154, the authors have determined the iron content of the livers of rats after the administration of iron and copper as supplements to a milk diet.

When iron was administered for 14 days to rats rendered anemic on milk alone, there was an increase in the iron content of the liver as well as in blood hemoglobin and erythrocytes. After the iron treatment was discontinued there was a corresponding decrease in liver iron and in hemoglobin and erythrocytes. The administration of copper without iron at the end of 14 days of iron administration was followed by a decrease in the liver iron but an increase in blood hemoglobin and erythrocytes. The authors conclude, as did Elvehjem and Sherman in similar studies (E.S.R., 68, p. 702), that "copper when given to anemic rats can mobilize the iron stored in the liver to produce hemoglobin and increase the red blood cells."

Studies on iodine absorption of serum in rats fed on fat-free diets, A. E. Hansen and G. O. Burr (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1200, 1201*).—A preliminary comparison of the iodine absorption of the serum lipids of 8 normal rats on a stock diet and of 8 on a fat-free diet gave the following minimum, maximum, and average results: Normal 435, 917, and 598, and fat-free 252, 395, and 309 mg iodine per 100 cc serum, respectively. These results are considered of special significance inasmuch as the stock diet was of relatively low fat content derived chiefly from milk, and consequently the body fat would probably be of as low iodine number as on an ordinary mixed diet.

Iodine numbers of serum lipids in rats fed on fat-free diets, A. E. Hansen and G. O. Burr (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1201–1203*).—In this supplement to the study noted above, it was found that the cholesterol and total fatty acids of the serum of rats fed on a fat-free diet were lower than in control animals. The iodine numbers of the serum fatty acids from the animals fed on the fat-free diet indicated that the fatty acids were less unsaturated than those of the controls.

Study of iodine number of serum fatty acids in infantile eczema, A. E. Hansen (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1198, 1199*).—In this preliminary report data are presented indicating that in infants suffering from eczema the serum cholesterol, total fatty acids, and total lipids are slightly lower than in normal infants. The iodine numbers of the serum fatty acids and the total iodine absorption values are also considerably lower. These findings, together with encouraging results obtained in the treatment of a few eczematous infants with liberal supplements of unsaturated fatty acids, suggest a relationship between infantile eczema and the unsaturated fatty acid deficiency disease in rats described by Burr and Burr (E.S.R., 62, p. 292), and lead the author to conclude that "while this evidence does not preclude the possibility of a lipid-protein combination, if these data can be substantiated further it appears that the unsaturated fatty acids must be given serious consideration as an etiological factor in infantile eczema."

Poisonous insecticides and plant sprays (*Jour. Amer. Med. Assoc., 101 (1933), No. 2, pp. 126, 127*).—In this editorial, attention is called to the significance to the consumer of the reports presented in the symposium on insecticides at the 1933 meeting of the American Chemical Society (E.S.R., 68, p. 717). Although it is thought that there is no danger of acute poisoning through the eating of fruits or vegetables commonly sprayed or tested with the insecticides in use, "in the interests of safety, not only from contamination by food handlers with infectious organisms but also because of the possible dangers from the metallic poisons that have been mentioned, it is well for the user to wash thoroughly and to cleanse such materials before putting them on the table in either the raw or the cooked form, and perhaps to strip and destroy the outer layers of lettuce, cabbage, and similar vegetables that lend themselves easily to such manipulations."

The economic depression and public health (*League Nations Health Organ. Quart. Bul., 1 (1932), No. 3, pp. 425–476*).—This memorandum, prepared by the health section of the League of Nations, includes a chapter entitled The Nutrition of the Unemployed, in which existing data on the diets of unemployed in Germany and Great Britain are summarized and discussed from the standpoint of quantitative and qualitative adequacy. The question of calorie reduction on account of unemployment is discussed, with emphasis on the fact that while the caloric needs of a workingman may be reduced by 27 percent during a period of unemployment the needs of those dependent on him remain the same. Caution is advised against providing the unemployed with work without providing them with a working diet. "The fact is well known that various food deficiency diseases—scurvy, beriberi, hunger edema—are specially apt to occur in those who, while consuming a deficient diet, are forced to make severe physical efforts. It is among the wives of the unemployed, whose duties are, if anything, increased when the breadwinner loses his job, that the effects of malnutrition are likely to be earliest in evidence."

The most suitable methods of detecting malnutrition due to the economic depression (*League Nations Health Organ. Quart. Bul., 2 (1933), No. 1, pp. 116–129*).—This report of a conference held at Berlin in December 1932, under the auspices of the health committee of the League of Nations, outlines the general plan drawn up by the conference for determining the state of nutrition of a population by inquiries into income, food intake, and social conditions of the people as a supplement to medical examinations for evidences of malnutrition. Appendixes are given on the Von Pirquet Sacratama and Pelidisi methods for determining the state of nutrition (by E. Nobel), clinical tests for malnutrition, and the estimation of physical efficiency and fatigability (by E. Atzler).

The administrative machinery by which the adequate nourishment of the poor is ensured in Great Britain, M. D. Mackenzie (*League Nations Health Organ. Quart. Bul., 2 (1933), No. 2, pp. 333–352*).—This paper, which should be of interest to food relief workers, describes in considerable detail the work and powers of central organizations and local committees responsible for the supply of food to the unemployed and destitute of Great Britain, the extent of food control, and the instructions and advice given concerning the purchasing and cooking of food. Additional information is given in appendixes on various points, including relief in kind, central kitchens, menus, food allowances to expectant and nursing mothers and infants through maternity and child welfare centers, provision of school meals by education authorities, the official feeding of the needy in Great Britain, and the work of the national milk publicity council.

Underfeeding of infants and children, G. J. Feldstein (*Arch. Ped., 50 (1933), No. 5, pp. 297–306*).—This is a general discussion of the principal types and causes of underfeeding of infants and children.

Adequacy of the diet of Texas school children, J. Whitacre and E. D. Terrill (*Texas Sta. Rpt. 1932, pp. 98–100*).—This progress report (E.S.R., 67, p. 770) consists of an analysis and interpretation of the data secured in diet records of 538 white and 196 negro children in Brazos County.

Diet in relation to small incomes, W. R. Aykroyd (*League Nations Health Organ. Quart. Bul., 2 (1933), No. 1, pp. 130–153*).—Of particular interest in this discussion of the subject are the sections devoted to the energy requirements of unemployed men and their families and comparisons of low-cost diets recommended in various countries. A table is given of low-cost weekly dietaries in England, Germany, the United States, and Denmark. The first two have been calculated for the present paper, the third is a diet recommended by Stiebeling and Birdseye (E.S.R., 65, p. 192), and the fourth is the recommendation of Hindhede in 1918. The values for the English and German dietaries are for an unemployed man, for the United States an adult man, and for Denmark per person in large families. A considerable similarity is to be noted in the four diets as regards food items, calories, and protein.

A section is devoted to dietary propaganda in the United States, with the comment that "the success of educational campaigns must depend very considerably on the popular interest taken in the scientific aspect of dietetics. In countries in which knowledge of such things as calories, vitamins, etc., is widely diffused, such as the United States of America, propaganda has more chance of success than in countries in which greater interest is taken in the art of preparing food than in food values."

Conference of experts for the standardisation of certain methods used in making dietary studies, E. P. Cathcart et al. (*League Nations Health Organ. Quart. Bul., 1 (1932), No. 3, pp. 477–483*).—This note by the chairman of the conference held in Rome, September 2 and 3, 1932, explains the purpose and general accomplishments of the conference and presents the conclusions drawn.

The principal question considered was "the possibility of reaching international agreement with regard to a scale (or scales) of family coefficients (consumption units) to be used in making dietary studies, in order to make the results of different workers more comparable." In answer to this question the following scale has been recommended for international use:

Proposed international scale of family coefficients

Age (years)	Coefficient [1]		
	Male	Both sexes	Female
0–2		0.2	
2 and 3		.3	
4 and 5		.4	
6 and 7		.5	
8 and 9		.6	
10 and 11		.7	
12 and 13		.8	
14–59	1.0		0.8
Over 60		.8	

[1] 1.0=3,000 calories gross.

This scale has been selected for its simplicity rather than absolute accuracy, and is recommended with the hope that "nutritional research workers, though they may prefer to use other scales in making their particular dietary studies, should also calculate food-intake per consumption unit in terms of the international scale. By the general use of the international scale, a comparison of the food-intake of different population groups subjected to dietary inquiries is rendered possible."

Three subsidiary questions were discussed and answered essentially as follows: "(a) Can greater accuracy and more general uniformity be achieved with regard to the food values to be used in the assessment of data? What food factors should be studied?" In answer to these questions the conference suggested that in dietary studies information be obtained not only on the intake of calories, protein, carbohydrate, and fat but also on the intake of animal and vegetable proteins, and that in reporting the results of family budget studies specific information be given on the quantities of each individual foodstuff consumed per family and per consumption unit, the particular foods being itemized rather than combined by food groups. It is noted particularly that the difference in food values between root and leafy vegetables makes it advisable to record the intake of each particular vegetable and the state in which it is consumed (fresh or dry).

"(b) Is it possible to formulate certain principles with regard to the technic to be employed in investigating the dietary habits of population groups?" The conference recommended that family dietary studies by the household accounts method should be supplemented by a more intensive study for at least a week of the food intake of a small (not less than 5 percent) sample of the total group, and that an attempt might well be made in a few families to determine the relative food intakes of individual members. The data collected for all should include occupation and the weight and height of different family members, including second measurements at the end of the study, if covering a long period. It was considered impossible to recommend a standard allowance for waste, but important that household waste be taken into account.

"(c) Can a useful definition of the terms 'light', 'moderate', and 'severe' work be arrived at? What is an 'average day's manual work' stated in terms of kilogrammeters?" It was considered impossible to define these terms, but the comment was made that "the determination of energy expenditure under normal conditions of labor is urgently required. If, and when, such data were available, it would then be possible to base the family coefficients on a more secure basis than the incorrect but historic 3,000 calories."

[Vitamin studies at the Missouri Station] (*Missouri Sta. Bul. 328 (1933), pp. 31, 32*).—Brief progress reports are given on a continuation of the studies on the action of radioactive substances on vitamins, by A. G. Hogan and W. S. Ritchie, the effect of ultraviolet rays on the dermatitis-preventing vitamin, by Hogan and L. B. Richardson; and on the vitamin D content of brown eggs (White Plymouth Rock) and white eggs (White Leghorn), by B. Bisbey and S. Cover (E.S.R., 67, p. 480).

Vitamins A and D in tuna meal, R. W. Truesdail and L. Shahinian (*Indus. and Engin. Chem., 25 (1933), No. 6, pp. 661, 662, fig. 1*).—Tuna meal, the product left after the cooked dark meat of the tuna fish has been pressed through a continuous screw press to extract oil and water, dried in a steam-jacket vacuum drier at 115° C. for from 3½ to 6 hours, and finally ground and screened, was analyzed and tested for vitamins A and D.

The composition of the meal was protein (N × 6.25) 62.09 percent, ash 18.24, moisture 8.61, fat (ether extract) 8.04, free fatty acid 0.97, and crude fiber 0.5 percent.

The meal proved to be a very good source of vitamin A. The smallest amount fed, 0.075 g daily, induced gains considerably in excess of unit gains. It is estimated that the sample tested "contained considerably more than 14 units of vitamin A per gram, making it comparable to butter, carrots, and dried whole milk as a source of this factor." The meal contained more than 62 American Drug Manufacturers' Association units of vitamin D per gram, thus comparing favorably with the poorer medicinal grades of cod-liver oil.

Vitamins C and A in blueberries, C. R. Fellers and P. D. Isham (*Jour. Agr. Res. [U.S.], 47 (1933), No. 3, pp. 163–165*).—In this investigation at the

Massachusetts Experiment Station, native western Massachusetts highbush blueberries, *Vaccinium corymbosum*, were used in 1931 and 1932 in the vitamin C tests on fresh blueberries. Some of the 1932 crop was also frozen in 1-lb. cartons at about —30° F. and stored at 0° until tested from 5 to 8 months later. Other blueberries tested included Maine lowbush species, probably *V. pennsylvanicum*, frozen in the same way during August 1931 and 1932, and Newfoundland berries (also of the lowbush type and presumably the same species) picked and frozen in 1931. Tests were also made of highbush and lowbush Massachusetts blueberries canned in 1931 and highbush berries in 1932. In the 1931 canning the highbush berries were blanched for about 30 seconds in boiling water, filled into spring-clamp glass jars, processed in a water bath at 212° for 8 minutes, and sealed. The lowbush berries were treated in the same way except that the jars were vacuum sealed at a partial vacuum of 25 in. of mercury. The 1932 highbush berries were filled directly into glass jars, covered with a previously boiled hot 10 percent sugar sirup, vacuum sealed at a partial vacuum of 20 to 22 in. of mercury, and processed at 212° for 8 minutes.

Preliminary vitamin A tests of Maine quick frozen blueberries showed no significant evidence of protection in 1- and 3-g doses, from which the authors conclude that the blueberries contained not more than a trace of vitamin A, less than 0.3 unit per gram. The vitamin C determinations were made by the Sherman-La Mer-Campbell method except that the amounts fed were proportional to the weight of the guinea pigs, which varied at the beginning from 280 to 325 g. The minimum protective dose for the two successive crops of highbush berries was from 4 to 5 g, with little or no loss as a result of quick freezing. The lowbush berries were much less potent in vitamin C than the high. The minimum protective dose of the 1932 berries, which were more potent than the 1931, was from 15 to 16 g daily. The Newfoundland berries were from 75 to 85 percent as potent as the Maine berries.

Too few canning tests were made to justify definite conclusions concerning the effect of canning on the vitamin C content of the blueberry, but the unblanched vacuum canned berries were much more potent than the blanched nonvacuum canned samples. Five g of the former afforded complete protection, while on 4 and 6 g of the latter severe scurvy resulted. The one canned sample of lowbush blueberries afforded very little protection at an 8-g level.

Effect of manufacturing and preserving processes on the vitamins of cranberries, P. D. Isham and C. R. Fellers (*Massachusetts Sta. Bul. 296 (1933), pp. 19, figs. 5*).—This bulletin constitutes the complete report of the extensive investigation of cranberries and cranberry products as sources of vitamins A, B, C, D, and G noted previously from progress reports (E.S.R., 67, p. 473) and incidentally as part of a general discussion of the nutritive value of cranberries (E.S.R., 69, p. 142). The report includes a brief discussion of the botanical relationships of the cranberry, a review of previous literature, a description of the source and preparation of the samples used in the present investigation, and a presentation in tables and charts of the vitamin data obtained.

Dehydrated cranberries contained 2 units per gram of vitamin A, from which it was calculated that if no loss occurred during dehydration fresh cranberries would contain at least 0.2 unit per gram. No significant amounts of vitamins B, D, and G were found. In the vitamin C studies, the minimum protective dose for guinea pigs of fresh cranberries was established at between 3.5 to 4.5 g daily, with only slight varietal differences. There was a gradual loss of vitamin C in cold storage, amounting to approximately 20 percent after from 4 to 6 months and from 60 to 70 percent after from 7 to 10 months.

Freezing did not destroy the vitamin C of whole, sliced, crushed, or sweetened cranberries. The temperature of freezing and the temperature and length of storage had little effect, but some evidence was obtained that the vitamin C content was lowered appreciably by thawing and subsequent freezing. Evaporated whole cranberries were very low in vitamin C, but dehydrated cranberry pulp prepared in an atmosphere of nitrogen retained 65 percent of the original vitamin C content. Fresh or boiled cold-pressed cranberry juice, with or without added sugar, showed very little loss in vitamin C content, but in all forms of bottled pasteurized juice most of the vitamin C was lost. As noted in the progress reports, whole fruit sweetened cranberry sauce retained from 75 to 80 percent of the original vitamin C, but strained sauce contained less than 20 percent. Jelly made from clear cranberry juice and cranberry candy filling contained little or no vitamin C.

A list of 41 references to the literature is appended.

Determination of the vitamin B, C, and G content of a commercial banana powder, C. H. Miller and H. E. Munsell (*Trained Nurse and Hosp. Rev., 86 (1931), No. 4, pp. 517–519*).—"The biological assay of a commercial banana powder indicates that it is a good source of vitamin G, retaining about three fourths of the vitamin of the fresh banana. It is also a fair source of vitamin B, comparing favorably with the fresh fruit. However, when fed at levels comparable to those used in infant feeding and invalid dietotherapy, the particular powder assayed contained no appreciable amounts of vitamin C."

Vitamin A content of milk irradiated by various carbon arcs, R. C. Bender and G. C. Supplee (*Amer. Jour. Diseases Children, 45 (1933), No, 5, pp. 995–998, fig. 1*).—Earlier studies on the vitamin A potency of irradiated milk (E.S.R., 58, p. 295) have been supplemented by further studies of milk containing 1.2 percent butterfat and experimentally irradiated with different carbon arcs under carefully controlled conditions (E.S.R., 67, p. 490), with the conclusion that there is no significant destruction of vitamin A as the result of such irradiation.

Vitamin A content of naturally colored nut margarines, C. F. Poe and H. A. Fehlmann (*Indus. and Engin. Chem., 25 (1933), No. 4, pp. 402, 403, figs. 2*).—Eight samples of nut margarines colored by the addition of palm oil were found to contain vitamin A in quantities of from 1.15 to 4.7 units per gram. The authors conclude that "palm oil shows promise as a source of growth-promoting substances in nut margarines."

Attention is called to the fact that under a decision dated November 12, 1930, the U.S. Bureau of Internal Revenue ruled that unbleached palm oil might be used as one of the substantial ingredients of oleomargarine, but that a law was later passed imposing a tax of 10 c. per pound on all naturally colored oleomargarines.

The effect of light upon the vitamin A activity and the carotenoid content of fruits, L. L. W. Smith and A. F. Morgan (*Jour. Biol. Chem., 101 (1933), No. 1, pp. 43–54, figs. 4*).—Apricots, peaches, and nectarines selected for their differences in pigment content were allowed to ripen on the tree (a) exposed to normal light conditions and (b) excluded from all light from the blossom stage to maturity by covering the blossom with a heavy black paper bag enclosed in white paper. Five kinds of tomatoes selected for gradations in color of flesh from pale yellow to deep red were grown in the greenhouse and out of doors and allowed to ripen naturally. One of the varieties was also ripened by exposure to ethylene. When gathered the fruit was ground, placed in small bottles in which the air was replaced by carbon dioxide, and stored in the dark at −17° C. until used. From samples of the various materials the pigments were extracted and determined quantitatively, as noted previously (E.S.R., 67, p. 245). Biological tests for vitamin A were made according to the authors' usual technic (E.S.R., 62, p. 93).

In the yellow Elberta peach, the fruits grown in the dark had a higher carotenoid content and vitamin A potency than those grown in the light. The opposite was true of the other fruits tested, which included the Mayflower, a white-fleshed peach; the Humboldt and Stanwyck, yellow-fleshed and white-fleshed nectarines; and the Royal, a deep yellow-orange-fleshed apricot. The flesh of the white nectarine, although giving no evidence of carotene, was not wholly lacking in vitamin A activity. The relative vitamin A potency of some of the fruits may be seen from the average weekly gains for a period of 56 days of young rats receiving 50 mg of the fruit daily unless otherwise stated: Royal apricot, tree-ripened 8.4 and bagged 7.2 g; Elberta peach, tree-ripened 4 and bagged 5 g; and Humboldt yellow nectarine (fed at a level of 200 mg daily) tree-ripened 8.4 and bagged 7 g.

Of the out-of-door normally vine-ripened tomatoes, the vitamin A content increased with depth of color. The pale yellow Clark Albino was practically free from vitamin A, with the potency increasing in the others in the order medium red California Earliana, red Globe, deep yellow Ruby Gold, and deep red Gigante Ingregnole. The same order was noted for the vitamin A content of tomatoes ripened under glass in the greenhouse and for the bagged samples. In all cases the greenhouse-ripened fruits were lower in vitamin A potency than those grown out of doors and the bagged fruits lowest of all. The effect of ethylene ripening was tested on samples of Gigante Ingregnole. These developed an extremely red color and had a higher carotenoid value than any of the other tomatoes examined, but the vitamin A activity was slightly less than that of the less deeply colored vine-ripened fruit. It is suggested that the proportion of lycopene to carotene may be higher in the ethylene-ripened than the vine-ripened fruit.

As shown by the growth of vitamin A-free rats fed 0.1 g daily doses of the Globe tomato picked at various stages of ripeness, there is a "relatively regular rate of increase in vitamin A content during the ripening process."

In the tests in which crystallized carotene from the various fruits was used as the source of vitamin A, a relationship approximating a logarithmic curve appeared to exist between the total growth per unit of carotene ingested and the level of daily carotene intake.

The vitamin B content of different samples of Indian rice by Spruyt's colorimetric method, II, H. W. Acton, S. Ghosh, and A. Dutt (*Indian Jour. Med. Res., 21 (1933), No. 1, pp. 103–107*).—This paper reports further tests by the Spruyt colorimetric method of the vitamin B content of Indian rice (E.S.R., 69, p. 761). In the present study samples of unmilled rice (paddy) were collected, prepared in the mill and laboratory under standard conditions, and tested both by the colorimetric method and by feeding experiments with munia birds.

The colorimetric data confirmed the previous results in showing that in parboiled rice the vitamin B penetrates into the grains. Not only was the milled parboiled rice richer in vitamin B according to this test than the milled nonparboiled, but the polishings from the parboiled were less rich than those from the nonparboiled samples. A considerable degree of correlation was shown between the color tests and the feeding tests, although the authors state that it will not be "safe to conclude from the small number of feeding experiments that there is any strict quantitative variation of the color index with the vitamin B content."

On arrest of growth and preserved capacity for growth in young rats suffering from partial vitamin B deficiency, S. Clemmesen (*Acta Path. et

Microbiol. Scand., *10* (*1933*), *No. 3*, *pp. 315–328*, *figs. 5*).—Preliminary experiments are reported in an extensive investigation of the mechanism of the action of the B vitamins. The particular questions studied in these first experiments were the length of time it is possible to check the growth of young rats through deficiency of these vitamins, the length of time under such conditions that the capacity for growth is preserved, and the possibility of attaining normal size and behavior after reassumption of growth.

Two different diets were used, one a vitamin B-free diet of purified casein 20.6, McCollum salt mixture No. 185 5.1, butterfat 15.5, and rice starch 58.8 percent, and the same with 5.1 percent rice starch replaced by 5.1 percent autolyzed dry yeast. The 4-weeks-old rats used in the experiment were from stock which for 3 years previously had been kept on the Gudjonsson diet 4 (E.S.R., 65, p. 589). Seven males and 7 females were kept on diet 2 to serve as normal controls and 19 males and 19 females on diet 1, with weekly supplements after the first 2½ or 3 weeks of 0.5 g of dry yeast, and with an occasional additional supplement as needed. With this technic the rats were kept for periods as long as 1½ years with weekly variations of not more than 10 g from their weight at the beginning of the experiment. After varying periods of time the stunted rats were given the normal diet and were observed for an additional period of at least 30 weeks and in some instances much longer.

In both males and females the gains in weight during the first 30 weeks after resumption of growth averaged practically the same in the experimental animals as in the controls during the first 30 weeks of the experimental period. The experimental animals eventually grew to the same size as the controls, thus demonstrating that the capacity for growth was fully preserved during the long stunting period. After the first 30 weeks the weight increases were also about the same as the controls if the animals succumbing to the infirmities of age in both groups are not considered.

In the arrest and sudden resumption of growth the bones and all of the organs were involved. As noted in the following paper, the condition of the animals during arrested growth was far from normal. Life was not prolonged by stunting.

Experimental pellagra in rats, S. Clemmesen (*Acta Path. et Microbiol. Scand.*, *10* (*1933*), *No. 3*, *pp. 304–314*, *figs. 15*).—This paper describes, with excellent photographic illustrations, the external symptoms of experimental pellagra as observed in some of the stunted rats in the investigation noted above. The small amount of yeast, about 0.5 g autolyzed dry yeast a week, was sufficient to keep the rats from dying of either polyneuritis or pellagra, and as the yeast contained more vitamin B_1 than B_2 pellagra developed in about half of the rats.

As a rule the earliest symptom was a slight scaliness of the skin of the hind paws. This gradually developed into thick inflamed crusts mixed with serous and bloody exudate. In the more sensitive rats the condition appeared in about 1 month, but in others not until from 16 to 23 weeks after the arrest of growth. Other regions affected somewhat later than the hind paws were the fore paws, tip of the muzzle, ears, eyes, and finally the chest, flanks, and back, usually but not always in symmetrical areas. The distribution of the lesions in 44 rats was paws 22, ears 31, muzzle 24, and around the eyes 4. In 39 of the animals there were necrotic lesions in the tail similar to those described in the literature as occurring on various deficiency diets. The author is of the opinion that the tail affection is hardly a feature of pellagra in the proper sense of the term, but rather a separate symptom, "perhaps a proteotoxic phenomenon." Another phenomenon noted was priapism in 21 out of 24 males in which growth had been arrested for more than 10 weeks. A general apathy is noted as developing gradually at the same time as the other symptoms. All of the symptoms disappeared within 2 weeks if the animals were given a normal diet with sufficient yeast, the first change being noticed very promptly.

The pellagra-preventive value of autoclaved dried yeast, canned flaked haddock, and canned green peas, G. A. Wheeler (*Pub. Health Rpts.* [*U.S.*], *48* (*1933*), *No. 3*, *pp. 67–77*).—Following the methods used in previous studies from the same laboratory in determining the pellagra-preventive action in human subjects of various foods (E.S.R., 67, p. 488), the author found that dried baker's yeast is a good source of the pellagra-preventive factor and that its potency is retained after heating in the steam autoclave at 15 lb. pressure for 7½ hours. Tests on rats showed that the autoclaving process had destroyed practically all of the antineuritic vitamin in the yeast.

Canned flaked haddock was found to contain the pellagra-preventive factor, but in amounts so small that a relatively large proportion of the haddock is required to supplement an otherwise pellagra-producing diet. Canned green peas were very effective, and are recommended as a practical and convenient source of the pellagra-preventive factor in pellagrous sections during the spring months when preventive supplements are most scarce.

The pellagra-preventive value of green cabbage, collards, mustard greens, and kale, G. A. Wheeler and D. J. Hunt (*Pub. Health Rpts.* [*U.S.*], *48* (*1933*), *No. 26*, *pp. 754–758*).—The materials used in this extension of the studies noted above were Mississippi-grown, canned, unheaded cabbage, mustard greens, and green Scotch kale and a commercial brand of canned collards. The collards and kale proved very satisfactory, as with the quantities fed (482 and 534 g, respectively, including the canned liquor) no pellagra developed during the year in 13 colored and 14 white female subjects, respectively. The canned green cabbage and mustard greens were not quite as satisfactory. One of the 15 colored female subjects receiving 482 g daily of the cabbage developed pellagra during the seventh month, and one of the 14 white female subjects receiving 533 g of mustard greens daily developed pellagra in the sixth month. As none of the others developed pellagra these materials are considered to be quite practicable contributory sources of the pellagra-preventive factor.

Nutrients necessary to impart vitamin potency to yeast (*Kentucky Sta. Rpt. 1932*, *pt. 1*, *pp. 32*, *33*).—This progress report summarizes the results obtained in studies of the nature and concentration of mineral nutrients and the form of nitrogenous compounds producing the most favorable growth in yeast cells.

Vitamin C content of strawberries and strawberry ice cream, C. R. Fellers and M. J. Mack (*Indus. and Engin. Chem.*, *25* (*1933*), *No. 9*, *pp. 1051*, *1052*, *fig. 1*).—Following the methods used in previous studies from the same laboratory (E.S.R., 69, p. 903), the authors at Massachusetts State College have determined the vitamin C content of fresh and frozen-pack strawberries and frozen-pack strawberries in ice cream. Two lots of fresh strawberries were frozen: (1) A Klondike variety shipped from the South and (2) a locally grown Howard Supreme variety. The first of these was available for only 50 and the other for only 46 days, after which mixed varieties were used for the rest of the test. Two lots of frozen berries were likewise tested: (1) Howard Supreme packed in 1-gal. cans and frozen with sugar in the ratio of 2:1 and held in freezing storage at 0° F. and (2) unsweetened Klondike berries frozen and stored by the Birdseye Laboratory in 1-lb. wax paper cartons and tested after storage for from 4 to 7 months. The ice cream was made from vitamin C-free ingredients with 30 percent defrosted frozen-pack Klondike berries and was held at —5° until used (1 to 3 months).

The results obtained indicate that both fresh and frozen strawberries of these varieties are excellent sources of vitamin C. Two g daily, the lowest quantity fed, gave full protection from scurvy and induced large weight gains. There was apparently no loss in the freezing and storing processes or in the manufacture of ice cream. It is thought that the low temperature must exert a marked protective action on vitamin C, as considerable air must have been incorporated in the ice cream.

The larger doses of the materials tested did not bring about as good growth gains as the smaller. "This effect has been repeatedly noted in other vitamin C assays and may be due to the disturbing effect on the digestive and nervous systems and to the unbalancing of the diet. In spite of poor or even negative weight gains, no scurvy was found on autopsy in any animal in this experiment."

Staining of the adrenals with neutral silver nitrate as a test for scurvy, R. H. HAMILTON, JR. (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1355, 1356*).—The suggestion of Siehrs and Miller (E.S.R., 69, p. 619) that the staining ability for silver nitrate of the adrenals of guinea pigs might serve as a convenient qualitative test for vitamin C was tried out by applying the test to the adrenals of guinea pigs which had died of scurvy and others which had been fed a scorbutic diet supplemented after a time by 1.5 cc of lemon juice for varying periods of time. In contrast with the rapid blackening of the adrenals of a guinea pig which had been on a diet of oats, carrots, and alfalfa hay, there was no change in, or only a slight graying of, the glands of the animals on the scorbutic diet supplemented with the lemon juice, in spite of the fact that the animals in the latter group showed no clinical symptoms of scurvy.

The author concludes that "it is necessary for the animal to have in its body an excess of vitamin C over and above its immediate requirements before any can be stored in the adrenal glands. If this hypothesis is true, one could not rely upon lack of staining of the adrenals with neutral silver nitrate as a qualitative test for the presence of scurvy sufficiently severe to produce gross signs. However, it might still be possible to use the reaction for assaying foods quantitatively for vitamin C. Animals could be maintained before the assay at such a level that the adrenals just failed to react. Upon feeding graded amounts of the test food to a series of animals, a positive reaction might be expected to appear within a few days in those receiving more vitamin C than is required for maintenance."

Sardine and tuna oils as sources of vitamin D, R. W. TRUESDAIL and H. J. CULBERTSON (*Indus. and Engin. Chem., 25 (1933), No. 5, pp. 563, 564*).—Data obtained by the method proposed by the vitamin assay committee of the American Drug Manufacturers' Association[1] are reported on the antirachitic potency of 4 raw sardine oils obtained from 3 fresh oil producers, 4 samples of refined tuna representative of 4 distinct commercial lots during a 2-year period, and 1 U.S.P. medicinal cod-liver oil of Norwegian origin.

Expressed in the units recommended by the committee, the values of the different oils were as follows: Raw sardine oil less than 155, 155, 155, and 208; refined tuna 125, 125, more than 208, and 208; and cod-liver oil 208 units per gram.

It is noted that sardine oils are made either from the whole fish, fish offal, or both, of the California pilchard (*Sardinia caerulea*). Tuna oils are pressed from the dark meat and off-color meat of the fish (*Neothunnus macropterus*) after cooking from 2¼ to 6 hours in direct steam cookers at a temperature of 105° C. The raw oil has a dark color and high content of free fatty acids and is always refined before marketing. "It is suggested that refined tuna oil, since it is produced from edible portions of the fish and possesses a light yellow color and a mild fish flavor, may be acceptable as a source of vitamin D in human therapeutics."

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[1] A. D. Holmes, Jour. Amer. Pharm. Assoc., 20 (1931), No. 6, pp. 588–594.

Studies on D-vitasterol.—IV, Activation of ergosterol solutions by irradiation with natural light [trans. title], A. JENDRASSIK (*Biochem. Ztschr., 252 (1932), No. 1-3, pp. 205-211*).—In continuation of a series of papers, some of which have been noted (E.S.R., 61, p. 297), data are reported on the vitamin D activity of ergosterol irradiated in direct and diffuse sunlight on the Jungfraujoch 3,450 m above sea level and at Budapest 100 m above sea level. The products irradiated at the higher altitude had activities of from 30 to 80 international units per milligram, depending upon the duration and conditions of exposure; and at the lower altitude, but with better conditions of exposure, activities up to 220 units per milligram. It is suggested that the antirachitic value of sunlight in various places might be estimated by the activation of ergosterol in this manner.

Viosterol of high potency in seasonal hay fever and related conditions, B. Z. RAPPAPORT and C. I. REED (*Jour. Amer. Med. Assoc., 101 (1933), No. 2, pp. 105-109, figs. 4*).—The effects of massive doses of viosterol were studied in three patients with infectious asthma, two with urticaria, and six with seasonal hay fever. The viosterol was without effect in the first two groups, but all of the hay fever patients were well protected during the season of 1932 as compared with previous seasons before this treatment.

In the opinion of the authors, the symptoms of overdosage of viosterol are easily recognized and quickly abated on discontinuance or reduction of the quantity administered. The symptoms are described as follows:

"The most common early symptom is nausea, sometimes accompanied by vomiting and less frequently by abdominal cramps and diarrhea. Later symptoms are headache, muscular weakness, pain in the muscles and joints, dizziness, and occasionally numbness and tingling in the extremities. These symptoms are not distinctive, but it appears probable, when they occur in a subject during the administration of viosterol and disappear on discontinuing the administration of viosterol or on reducing the dose, that they are due to the treatment. They may occur singly or in any combination. In fact, the same subject may display very different symptoms at different times."

Some nutritional phases of dental conditions, P. R. HOWE (*Jour. Amer. Dental Assoc., 20 (1933), No. 2, pp. 233-240*).—In this paper, presented at the 1932 meeting of the American Dental Association, the author summarizes from his own research and that of others the specific effects on dental tissues of deficiencies in vitamins A, C, and D and the probable effects of other dietary factors.

In the discussion of this paper by G. W. Clapp, attention is called to the application of the information presented to some of the problems of partial denture construction. "Partial dentures are sometimes tissue-borne, sometimes tooth-borne, sometimes borne by both teeth and tissues. They, therefore, depend for stability and efficiency on the adjoining teeth and the underlying tissues, and their presence has important effects on these teeth and tissues. Under such conditions, of what importance is nutrition to their success and durability?" In answer to this question the amount of stress which the supporting tissues must undergo is estimated, and it is emphasized that the quality of the bone by which these teeth are supported, the vitality of the attachments to that bone, and the circulation within the teeth are all extremely important in helping to withstand this extra stress.

The production and prevention of dental caries, M. C. and R. G. AGNEW and F. F. TISDALL (*Jour. Amer. Dental Assoc., 20 (1933), No. 2, pp. 193–212, figs. 13*).—The literature on the subject since 1917 is reviewed briefly, and data are reported on attempts to produce and prevent dental caries in rats by dietary measures. The diets included 2 of normal composition; 1 containing protein of high biological value, plenty of minerals with the exception of phosphorus, and but little vitamin D; the same diet corrected for vitamin D; and 8 modifications of the Steenbock-Black rachitic diet to alter the concentration of calcium and phosphorus and to provide additional vitamins and minerals. After definite periods on the various diets the rats were sacrificed for ash determination on the fat-free tibia and fibula and microscopic and macroscopic studies of the oral tissues. In some instances blood was taken for determinations of the inorganic phosphorus.

The dietary deficiencies which were apparently responsible to the greatest degree for the production of caries were those of phosphorus and vitamin D. All but 1 of 71 animals fed the diet low in phosphorus and in vitamin D for periods of from 2 to 7 months showed dental caries. The addition of materials furnishing vitamins A, B_1, B_2, C, and E to the diet had no effect. The addition of phosphorus prevented the development of caries in 4 out of 7 rats when fed for from 2¾ to 6 months, and of vitamin D in the form of viosterol in 6 out of 19 rats when fed for periods of from 2½ to 5 months. In 5 out of 10 rats on diets low in phosphorus and vitamin D, but adequate in other respects, dental caries developed, while in 9 animals fed the same diet supplemented with viosterol for periods of from 6 to 13 months there was no sign of dental caries. Of the two dietary factors, phosphorus is thought to be of greater importance than vitamin D in the prevention of dental caries in rats.

Preliminary observations of the dental condition of children in three groups—on the ordinary diet of the institutions in which they lived, on the same diet with additional vitamin D, and on the same diet with additional vitamin D and phosphorus—have indicated a lessened incidence of caries, arrest of previously existing caries, and improvement in the general condition of the gingivae and mucous membranes in children receiving additional vitamin D.

TEXTILES AND CLOTHING

Fundamentals of fibre structure, W. T. ASTBURY (*London: Oxford Univ. Press, 1933, pp. [XI]+187, pl. 1, figs. 62*).—This book comprises six lectures delivered to Yorkshire textile students and operatives, entitled The Fundamental Nature of Matter and Radiation, The Invisible Fibres of the World of Molecules, How Atoms and Molecules Make Patterns in Space, An X-Ray View of the Inside of a Textile Fibre, The Fundamental Structural Difference Between Wool and Other Fibres, and Some Inside Information About the Properties of the Wool Fibre. A bibliography and index are included.

Raw textile materials, M. DUBRAU (*Textilrohstoffe. Berlin: Borntraeger Bros., 1932, pp. VIII+247, pls. 3, figs. 151*).—A practical exposition is given of the origins, extraction, characteristics, trade, and spinning of the important natural and artificial textile fibers derived from plant, animal, and mineral sources.

Studies of stability of color in raw cotton, D. NICKERSON and L. D. MILSTEAD (*U.S. Dept. Agr., Bur. Agr. Econ., 1933, pp. 22, figs. 8*).—A series of seven cottons from different parts of the Cotton Belt was examined in cooperation with the Texas Experiment Station and with the assistance of the South

Carolina and Mississippi Experiment Stations, to determine the kind and amount of color change in cotton and the extent to which other factors are related to these changes.

The color and grade were lowered as the cotton remained open and exposed in the field. Upland cottons at time of opening were fairly constant in brightness, although varying greatly in creaminess or chroma. The creamier cottons held their brightness better than the whiter cottons, and usually there seemed to be a high correlation between amount of rainfall and change in brightness. Data regarding color differences, shown by cottons opening early and late in the season, were considered an inadequate basis for conclusions on the effect of time of opening. The color of cottons opening at or after a killing frost is compared with that of other cottons.

Length and strength tests revealed no definite trend of change with time of exposure, although a relation seemed to exist between the long cottons and the strong ones. The cottons opening after frost were longer than others of the same series, and they were also stronger than cottons picked late in the season from the same field. The percentage of moisture regain gave no evidence of regularity of change in ability to absorb moisture within any single series, nor was any real difference apparent among the series of samples. Cotton kept at room temperature changed very little in color in 10 or even in 20 weeks, although original brightness and creaminess decreased slightly.

Cottons kept at about 133° F. for three months gained creaminess, with seed cottons and lint cottons differing little in result. Cotton heated in the seed did not average quite so much color gain as did the cottons removed from the seed before heating. Cottons heated at 230° for several days showed a still greater increase in amount of yellow color. The white cottons seemed to gain more color than those that were originally creamy.

Durability of white and colored cotton materials, A. E. Ginter, S. Pearlmutter, and M. Partlow (*Missouri Sta. Bul. 328 (1933), p. 31*).—This progress report deals with the effect of wear due to use and to laundering on tensile strength, fillingwise and warpwise.

The effect of Texas sunlight on the durability and color of cotton fabrics, M. A. Grimes (*Texas Sta. Rpt. 1932, p. 97*).—The progress of studies is noted briefly.

HOME MANAGEMENT AND EQUIPMENT

Amount of time spent and number of steps taken in kitchen work in relation to the kind and arrangement of equipment (*Vermont Sta. Bul. 360 (1933), p. 27*).—This progress report describes the technic followed in this study of kitchen rearrangement under controlled conditions, with alteration of but one piece of equipment at a time.

Home refrigeration methods in rural Rhode Island, B. M. Kuschke and M. Whittemore (*Rhode Island Sta. Bul. 239 (1933), pp. 19, figs. 3*).—The results of a survey of the types and efficiencies of refrigeration methods used in rural Rhode Island are presented, together with the results of laboratory tests of different types of new refrigerators.

The data obtained emphasize the fact that the use of a spring, cellar, or well is not to be recommended as a safe method for storing perishable food, such as milk, meats, and meat broths.

Although the temperatures maintained by ice refrigerators appear somewhat high, there is considered to be no doubt that this method may be thoroughly satisfactory if the right equipment is selected. While efficient ice chests and refrigerators are being made at a very moderate cost, the long life of the ice refrigerator as shown by the data reported seems to justify a reasonable investment.

The mechanical refrigerator furnishes most desirable and adequate food storage temperatures. The initial cost seems high. If, however, the life of the equipment proves to be a reasonable number of years, and the maintenance expense is low, then the mechanical refrigerator will prove a good investment, as more satisfaction, convenience, and health protection may be obtained by the mechanical method than any other.

Very satisfactory results were obtained in the experiments with the kerosene operated refrigerator. The freezing of ice cubes and desserts was as well done as in the electric refrigerator.

Suggestions for selecting a refrigerator are included.

MISCELLANEOUS

Forty-fifth Annual Report of [Kentucky Station], 1932, I, T. P. Cooper (*Kentucky Sta. Rpt. 1932, pt. 1, pp. 75*).—The experimental work not previously reported is for the most part noted elsewhere in this issue. Meteorological observations are also included.

Work of the [Missouri] Agricultural Experiment Station, [1932], F. B. Mumford, S. B. Shirky, et al. (*Missouri Sta. Bul. 328 (1933), pp. 46, figs. 4*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report [of Tennessee Station], 1932, C. A. Mooers et al. (*Tennessee Sta. Rpt. 1932, pp. 47, figs. 2*).—The experimental work reported is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report [of Texas Station], 1932, A. B. Conner et al. (*Texas Sta. Rpt. 1932, pp. 232*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-sixth Annual Report [of Vermont Station, 1933], J. L. Hills (*Vermont Sta. Bul. 360 (1933), pp. 32*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Kansas College and Station.—Dean and Director L. E. Call has been granted leave of absence until June 30 to serve as head of the Federal Land Bank of Witchita. Dr. W. E. Grimes, head of the department of agricultural economics, will serve as acting dean and director during his absence, and Harold Howe, associate professor of agricultural economics, as acting head of the department of agricultural economics.

Dr. F. L. Duley, professor of agronomy (soils), has been granted leave of absence until June 30 to become regional director of soil erosion work in Jewell County for the U.S. Department of the Interior.

Maine University.—Arthur L. Deering, director of extension, has also been appointed dean of the College of Agriculture, beginning in November 1933.

Massachusetts College.—Provision has been made for the erection with Federal funds of a men's dormitory and a library building, as well as for considerable renovation and extension of campus facilities, improvements at the Waltham Field Station and the cranberry substation, and the construction of trails and fire lines in the college-owned forest on Mount Toby.

Missouri University and Station.—The Frasch Chemical Foundation has approved an extension for a second five years of the station project on growth and development of domestic animals. The new grant will provide $9,000 per year from this source, and the work will be continued under the immediate direction of Dr. S. Brody and the supervision of a special station committee, consisting of the director and the chairmen of the departments of agricultural chemistry, animal husbandry, dairy husbandry, and poultry husbandry.

D. W. Chittenden, assistant professor of animal husbandry and assistant animal husbandman, has accepted an appointment beginning January 1 as chairman of the department of animal husbandry in the Montana College.

Ohio State University.—Dr. Herbert Osborn, recently retired as professor emeritus of zoology and entomology, has donated his extensive collections of *Hemiptera* to the university. The trustees in accepting the gift appointed J. N. Knull, formerly with the State Bureau of Plant Industry of Pennsylvania, as curator of insect collections and provided additional housing equipment in the department of zoology and entomology to insure permanent care and preservation of these and other collections belonging to the institution.

V. R. Wertz has been promoted to associate professor of rural economics vice C. R. Arnold, who has become associated with the U.S. Farm Credit Administration.

Cornell University.—The aggregate registration reported for the College of Agriculture is 919, a larger number than at any time since 1917.

South Dakota Station.—Florence V. Barr has been appointed research assistant in home economics.

Virginia Polytechnic Institute.—Under plans recently approved by the Federal Emergency Administration of Public Works, $1,066,000 is to be made available for building construction and campus improvement. Among the major items are two dormitories costing, respectively, $300,000 and $200,000, a $370,000 teaching and administration building, a $100,000 utilities building, and extensions of the water and sewage systems. The administration building will contain an auditorium adequate to seat the entire student body.

EXPERIMENT STATION RECORD

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EDITORIAL

THE PASSING OF PRESIDENTS THOMPSON AND THATCHER

The closing weeks of the year 1933 brought to an end the careers of two leaders eminent in the land-grant institutions during the present century. On December 5, Dr. Roscoe Wilfred Thatcher, associated with these institutions in Nebraska, Washington, Minnesota, New York, and Massachusetts, died while at work in the experiment station laboratory at the Massachusetts State College. Four days later, Dr. William Oxley Thompson, president of the Ohio State University from 1899 to 1925, and subsequently president emeritus, passed away in Columbus, Ohio.

Both Drs. Thompson and Thatcher were born in Ohio, the former on November 5, 1855, and the latter on October 5, 1872. Dr. Thatcher, however, left the State as a boy of 13, while Dr. Thompson, aside from the decade of the eighties, spent his long life mainly within its borders. Muskingum College bestowed upon him the degrees of A.B. in 1879, M.A. in 1881, and Ph.D. in 1891. He fitted himself for the Presbyterian ministry at the Western Theological Seminary in Pennsylvania, held pastorates in Iowa from 1882 to 1885, and served as president of Longmont College in Colorado and local pastor from 1885 to 1891. Returning to Ohio, he was for 8 years president of Miami University, resigning in 1899 to become head of the Ohio State University.

Although 44 years of age when undertaking this task, with a background of training and experience apparently having little in common with the land-grant institutions as a group, President Thompson speedily became recognized as not only a capable and forceful executive but an educator of ready comprehension, broad vision, and outstanding personality. He was elected president of the Association of American Agricultural Colleges and Experiment Stations in 1903, and in 1908 became chairman of its executive committee, serving in this key position of leadership until impaired health overtook him in 1919. During this period such important matters as the passage and early administration of the Smith-Lever

Act and the mobilization of institutional resources for special service to the Nation during the World War placed unusual responsibility upon the committee and its head. His work as a whole in this connection was acknowledged as of a high order, well characterized at the time of his withdrawal in a minute, prepared for the committee, reading essentially as follows: "Tactful yet outspoken, courteous yet forceful, with ready wit and a firm grasp of the fundamental principles upon which the land-grant colleges and universities are based", he "has been a potent force in shaping the policies and guiding the fortunes of this organization."

Unlike President Thompson, Dr. Thatcher was himself a product of the land-grant institutions, and practically all of his active service was in connection with them. He was graduated from the University of Nebraska in 1898 and given the M.A. degree in 1901. After 2 years as assistant chemist in the Nebraska Experiment Station and 6 years as assistant chemist and chemist in the Washington Station, he became director of that station and professor of agricultural chemistry in the Washington State College. Then followed 8 years at the Minnesota University and Station, first as professor of plant chemistry and from 1917 to 1921 as dean of the department of agriculture and director of the station. He succeeded Dr. W. H. Jordan as director of the New York State Experiment Station in 1921 and 2 years later became director of the Cornell Station as well. In 1927 he was appointed president of the Massachusetts Agricultural College. Resigning this position after 4 years on account of ill health, he had recently resumed his work at that institution as research professor of chemistry.

Dr. Thatcher's career had thus been an unusual mingling of research and administrative responsibilities, and in both fields he had achieved signal success. As a chemist, he had initiated and continued extensive wheat and flour investigations, studies of soils and insecticides, and of late had embarked on an exploration of an important phase of plant physiology. He was the author of Chemistry of Plant Life, widely used as a textbook, and of well over a hundred scientific articles. A charter member of the American Society of Agronomy, he became its president in 1912 and editor of its journal from 1922 to 1928. He was president of the Society for the Promotion of Agricultural Science in 1919. In 1928 he headed a committee appointed by the American Chemical Society to allot funds for research in agricultural chemistry under the Elizabeth Blee Frasch Fund, and subsequently he had served actively as technical adviser in the supervision of the projects authorized.

As a station director and college president, he had been associated with noteworthy developments in four States. Among the more conspicuous achievements during his leadership were the strengthening and upbuilding of the station organization in Washington and Minnesota, the coordination of agricultural research at the New York State Station and at Cornell University, and in Massachusetts the ending of a controversial issue of long standing as to institutional aims and objectives by the change of name of the Massachusetts Agricultural College to the Massachusetts State College. He, too, was long a well known and influential figure in the Association of Land-Grant Colleges and Universities, serving for several years as vice president and as chairman of the committee on experiment station organization and policy and of the joint committee on publication of research. In these various capacities, as well as in his numerous addresses before various groups in the association and in other ways, he was a consistent exponent of high ideals as regards research objectives, methods, and publications.

Both Presidents Thompson and Thatcher were in wide demand as speakers and advisers, and both were recipients of many honors. The degree of LL.D was conferred upon President Thompson by no fewer than 10 institutions, while President Thatcher was similarly honored by Hobart and Amherst Colleges, in addition to the D.Agr. degree from the University of Nebraska and the Sc.D. from the Catholic University of Chile. Appreciation of their qualifications was also manifested in numerous special appointments. Thus, President Thompson served as chairman of the special American Agricultural Commission which visited England and France in 1918 to make a special study of sources of food supplies for the Allies, and President Thatcher as a member of the Agricultural Conference appointed by President Coolidge in 1924. In this connection it may be of interest to recall that a portion of the report of this conference, said to have been written by Dr. Thatcher, advocated early passage in modified form of the Purnell bill, which had been pending for several years. This report was transmitted to Congress on January 28, 1925, with a recommendation from President Coolidge for "suitable legislation at the earliest possible date," and was followed by the passage of the Purnell Act as thus modified during the month following.

Few leaders in a common cause have been more dissimilar in personality, training, and opportunity than Presidents Thompson and Thatcher, and to attempt further comparison of their careers would doubtless be inappropriate and futile. Each made in his own characteristic way a unique and important contribution to land-grant institutional history, and in so doing both rendered an essential and timely service to the Nation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The oxidation of cysteine with iodine: Formation of sulfinic acid, D. G. Simonsen (*Jour. Biol. Chem., 101 (1933), No. 1, pp. 35–42.*)—Reversing the procedure usually adopted in the iodine titration of cysteine, i.e., adding the cysteine solution to the iodine solution, resulted in the formation of an isolable fraction containing a compound which showed sulfinic acid properties. When cysteine was oxidized by means of potassium iodate in the presence of potassium iodide an almost quantitative oxidation to cystine took place; but when the iodate acted upon cysteine in the absence of potassium iodide a sulfenic acid (R-S-O-H) appeared to be one of the products of the reaction. The experiments described are considered to offer evidence that the oxidation of cysteine by iodine proceeds through the stages:

$$\text{R-SH}\rightarrow\text{R-SOH}\rightarrow\text{R-SO}_2\text{H}\rightarrow\text{R-SO}_3\text{H}.$$

The solubility of glutamic acid in water and certain organic solvents, V. A. Pertzoff (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 97–104, fig. 1*).—The author determined the solubility of *d*-glutamic acid at 25° C. in water, methanol, ethanol, and acetone. The results, given as mols in 1,000 g of the solvent, were: Water 0.0595, methanol 4.8×10^{-4}, ethanol 4.6×10^{-4}, acetone not more than 2.5×10^{-6}. The heat of solution of *d*-glutamic acid in water was calculated as 9,600 calories.

Adsorption and hydrolysis of glycogen, G Bancroft and E. G. Fry (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 255–265, figs. 2*).—This investigation showed glycogen to be very strongly adsorbed upon the charcoal used, and indicated that the hydrochloric acid hydrolysis of glycogen in the presence of the charcoal depends (to all appearances, entirely) upon the concentrations of the free reactants, not at all upon the considerable quantities of adsorbed glycogen. Enzymic hydrolysis was found to be slightly affected by the adsorption upon charcoal of either reactant.

Some analyses of egg-shell keratin, H. O. Calvery (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 183–186*).—The author removed the contents of eggs not more than one day old, washed away the adhering white, suspended the shell material in hydrochloric acid of a concentration of from 3 to 5 percent to remove inorganic substances, and, after washing the crude shell protein, digested for several days in a pepsin hydrochloric acid medium to dissolve digestible proteins. The keratin preparation resulting from these treatments was thoroughly washed with distilled water, dehydrated by means of alcohol and ether, and dried under reduced pressure over sulfuric acid. Eighty g of the protein were obtained from the shells of 800 eggs.

This material was found to contain ash 0.05 percent, moisture 8.6, nitrogen 16.57, and sulfur 3.78 percent; and it yielded the amino acids, tyrosine 2.54 percent, glycine, alanine, valine, leucine, proline 3.83 percent, glutamic acid 10.11, aspartic acid 3.38, tryptophan 2.61, cystine 12.67, arginine 8.88, histidine 0.86, and lysine 3.66 percent. With these figures are tabulated for comparison the data from such previous determinations as have been recorded.

The preparation of aliphatic cholesteryl ethers and cholesterilene, E. Müller and I. H. Page (*Jour. Biol. Chem., 101 (1933), No. 1, pp. 127–132*).—Cholesteryl ethers were obtained in good yield by heating monocholesterylphosphoric acid with the corresponding alcohol and sulfuric acid. The preparation of the methyl, ethyl, *n*-propyl, and isopropyl ethers in this manner is detailed, and certain of the properties of the ethers are stated.

The hydrocarbon cholesterylene, $C_{27}H_{44}$, was obtained in a 40 percent yield, together with phosphoric acid, on heating monocholesterylphosphoric acid at 200° C. By a similar treatment of dicholesterylphosphoric acid cholesterylene was obtained in a yield amounting to 50 percent of the theoretical. The analyses, melting points, optical rotations, and iodine numbers of these preparations are recorded.

Intermediary compounds in the acetone-butyl alcohol fermentation, M. J. Johnson, W. H. Peterson, and E. B. Fred (*Jour. Biol. Chem., 101 (1933), No. 1, pp. 145–157, fig. 1*).—The authors of this contribution from the Wisconsin Experiment Station attacked the question as to the occurrence of certain probable intermediates in the fermentation of carbohydrates by *Clostridium acetobutylicum* (1) by attempting the isolation of the compounds, and (2) by determining their fermentability.

"Acetoacetic acid when added to vigorously fermenting culture was rapidly decarboxylated to acetone. The ability of the organism to ferment acetoacetic acid reached a maximum at the time of most rapid acetone production. Decarboxylation of the acid was also accomplished by centrifuged and washed cells of *C. acetobutylicum.* The decarboxylating agent was not contained in a Berkefeld filtrate of the culture and hence appears to be intracellular. Pyruvic acid was readily fermented by the organism. It was transformed mainly into acetic acid, acetone, and acetylmethylcarbinol. A new method for the estimation of pyruvic acid has been developed. β-hydroxybutyric acid, when added to a vigorous fermentation of glucose, was apparently not destroyed. However, it did not interfere with the continued progress of the fermentation. Also attempts to isolate this acid from a normal fermentation failed. Methylglyoxal and aldol, even in small amounts, proved toxic to the organism."

Fruit enzyme investigations, W. V. Cruess, R. Samisch, and H. M. Pancoast (*Fruit Prod. Jour. and Amer. Vinegar Indus., 12 (1933), No. 11, pp. 323, 324, 344*).—Certain of the data obtained by the authors of this contribution from the University of California supported the theory of Onslow (E.S.R., 65, p. 212) that a compound or compounds containing the catechol grouping may play an important part in the complete oxidase system of some fruits. Aluminum salts had a marked inhibitive effect upon fruit peroxidase, an effect in excess of that attributable to the pH decrease caused by the hydrolysis of the aluminum salts.

Dried apricots darkened in storage as rapidly when they had been steamed to destroy peroxidase as when the peroxidase was allowed to remain active. The darkening in this case appeared not due to oxidase action. Apricot peroxidase could be destroyed by sulfur dioxide at a concentration of 0.65 percent.

The effect of radiant energy on diastase activity, A. H. Hutchinson and M. R. Ashton (*Canad. Jour. Res., 9 (1933), No. 1, pp. 49–64, figs. 8*).—Full irradiation from a mercury vapor arc retarded the dextrin and sugar-producing effect both of salivary and of malt diastase. When radiations of specific wave lengths are isolated, however, "in the case of salivary diastase the rates of dextrin production and of maltose production are decreased by the green and the far ultraviolet wave lengths, while both tend toward stimulation when irradiated with the red-yellow and near ultraviolet wave lengths. The monochromatic effects on malt diastase are generally inhibitory for the dextrinogenic phase and stimulatory for the saccharogenic phase. These results may be explained by the presence of two enzymes constituting the diastase, one dextrinogenic, the other saccharogenic; either may be the less active and so become the 'pace setter' for maltose production; in the dextrinogenic phase one only is considered, in the saccharogenic phase, both are involved; in salivary diastase the dextrinogenic enzyme is the 'pace setter', while in malt diastase the saccharogenic enzyme is usually the 'pace setter'; full illumination, however, retards the dextrinogenic enzyme until it becomes the 'pace setter.'

"The effects of monochromatic light on the growth of *Paramecium* parallel the effects on the activity of salivary diastase, and the effects of monochromatic light on the sporulation of *Colletotrichum* parallel the effects on the saccharogenic activity of malt diastase."

Oxidation-reduction potential of ascorbic acid (vitamin C), H. Borsook and G. Keighley (*Natl. Acad. Sci. Proc., 19 (1933), No. 9, pp. 875–878, fig. 1*).—Data are reported on the reduction potentials at 35.5° C. of different mixtures of reduced and oxidized ascorbic acid at different H-ion concentrations. These show that at any given pH between 2 and 5.75 the potential is proportional to the ratio of the concentrations of reduced and oxidized forms. At a more alkaline concentration than pH 5.75 the rate of decomposition of the oxidized form was found to be too rapid to measure reliably.

"The potentials obtained elucidate the earlier observations on the stability of vitamin C, its behavior toward various oxidizing and reducing agents, and its physiological action. These considerations will be presented in detail later."

The reducing capacity of plant food materials and its relation to vitamin C.—VI, The purification of the reducing material in rose hips and its identity with vitamin C [trans. title], J. Tillmans, P. Hirsch, and R. Vaubel (*Ztschr. Untersuch. Lebensmtl., 65 (1933), No. 2, pp. 145–167*).—In this continuation of the series of studies noted previously (E.S.R., 69, p. 7), the authors, after preliminary unsatisfactory attempts to use potatoes as the source material, isolated the crystalline reducing substance from rose hips and determined its physical and chemical properties and antiscorbutic activity. The crystalline substance agreed in all respects with Szent-Györgyi's ascorbic acid and protected guinea pigs from scurvy in daily doses of 0.5 mg.

Substances which interfere with the antimony trichloride test for vitamin A, R. E. Corbet, H. H. Geisinger, and H. N. Holmes (*Jour. Biol. Chem., 100 (1933), No. 3, pp. 657–666*).—In this study of the maximum quantities of certain substances which may be present in a solution of a concentrate of vitamin A without interfering with the blue test with antimony trichloride, two series of experiments were conducted. The first consisted in testing the effect of refluxing certain substances with a 30 percent by volume chloroform solution of cod-liver oil and the second in testing the effect of adding various substances to a chloroform solution of haliver oil concentrate.

In the first series glacial acetic acid and N nitric acid lowered the blue value of the cod-liver oil very slightly and N acetic, hydrochloric, and sulfuric acids had no effect, concentrated HCl decreased the value by about 60 percent, 1 drop of concentrated H_2SO_4 in 10 cc of the cod-liver oil solution produced a purple color immediately which masked the antimony trichloride reaction, and 5 drops of concentrated HNO_3 in 10 cc of the solution produced an intense yellow color which interfered completely with the blue color.

The materials used in the second series were tabulated in three groups as substances which do not interfere, interfere mildly but produce no color alone with antimony trichloride, and interfere seriously and produce a color alone with antimony trichloride. The materials in the first group consisted of various saturated fatty acids and a heterogeneous group of organic solvents, including carbon tetrachloride, carbon disulfide, cyclohexane, benzene, toluene, coconut oil, and cholesterol. In the second group were saturated alcohols, various esters, ether, acetone, xylene, nujol, and butterfat. The third group included substances like quinone which interfere with the blue test only as long as they produce a visible color by themselves, and others like skatole which interfere beyond the dilution at which they themselves cease to give a color. The degree of saturation and the configuration of the molecule were found to have direct relation to the effect produced with antimony trichoride.

The determination of total bases, S. L. Wright and C. L. Allison (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 1–11, figs. 2*).—The authors modified the benzidine method for total base determination to allow its use with feces and other material rich in calcium and phosphorus. The preliminary titration for excess H_2SO_4 has been eliminated, and the intensity and duration of ignition has been standarized. The method as outlined provides for the use of Pyrex in place of platinum or silica vessels.

Determination of selenium in wheat and soils, W. O. Robinson (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 423, 424*).—In the methods described in this contribution from the U.S.D.A. Bureau of Chemistry and Soils use was made of the fact that the chlorides or bromides of selenium, germanium, and arsenic only can be distilled from aqueous solutions of the corresponding acids. Distillation of the bromides from hydrobromic acid solution was found preferable as an analytical procedure. The distillate could be evaporated without loss of selenium by keeping the selenium in the oxidized condition by means of sufficiently frequent addition of bromine water. The selenium present could then be precipitated in the form of the free element by adding hydroxylamine hydrochloride solution to the solution of the selenium compounds in hydrobromic acid of a concentration approximating 12 percent.

For the determination of selenium in wheat, 100-g samples of the flour were treated with a solution of 10 g of calcium acetate, thorough mixture was effected, the sample was dried, and ashing was carried out at a temperature not allowed to exceed 525° C. until the outside of the mass was gray, while some of the char still remained inside the lumps. From this partially ashed material the selenium was distilled with hydrobromic acid as above described; or, "the ash was treated with hydrobromic acid and bromine water and filtered. The filtrate was then treated as described for the distillate."

From a soil of which a 100-g sample was taken, extraction was effected by heating on a water bath with aqua regia, and, after filtration of the extract, sulfurdioxide was passed through the liquid, followed by hydrogen sulfide. "The precipitate containing sulfur, selenium, and so forth, was filtered, removed from the filter paper, and transferred to a closed glass tube. The bulk of the sulfur was cautiously volatilized, and the residue was dissolved in bromine water and hydrochloric acid. From this solution the selenium was precipitated in the usual manner."

In the case of the wheat samples (toxic wheats) duplicate determinations of 10 and of 12 p.p.m. and of 5 and of 6 p.p.m., respectively, were made; the gluten of the toxic wheat showed 90 p.p.m. of selenium; nontoxic wheat was not found to contain any selenium; and when this element was added to such nontoxic wheat samples, "nearly all could be recovered by the method given." Wet oxidations of wheat samples appeared to result in the loss of the selenium.

The soil sample analyzed was found to contain 0.3 p.p.m. of selenium.

Sources of error in the Gutzeit method for the determination of arsenic, C. R. Gross (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 398–403, fig. 1*).—Low results traced by the author of this contribution from the U.S.D.A. Bureau of Chemistry and Soils to the presence of incompletely oxidized pyridine compounds could be avoided, together with the effects of other interfering compounds, by precipitating the arsenic with the magnesium ammonium phosphate formed on treating the solution of the oxidized material with ammonium hydroxide, phosphoric acid, and magnesium mixture as in A.O.A.C. determination of arsenic in food colors.

Incomplete reduction was found due, under some conditions, to the use of granulated zinc, of which the solution and hydrogen evolution were found to be too rapidly completed. Stick zinc, evolving hydrogen more slowly and over a much longer period, permitted recoveries of about 93 percent of the total arsenic present from samples containing 10 or 30 micrograms of the element. With stick zinc and a reduction period of not less than 30 minutes at a temperature not below 25° C. the results were satisfactory.

Note on determination of hydrogen peroxide, A. K. Balls and W. S. Hale (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 395–397*).—The authors of this contribution from the U.S.D.A. Bureau of Chemistry and Soils find that "in the estimation of hydrogen peroxide, the iodometric method has the advantage over the more usual permanganate titration in that it is uninfluenced by sugars, glycerin, and like substances. Even phenols, including the actively reducing pyrogallol, react so slowly with iodine and with hydrogen peroxide that they are ineffective. In general, the ballast material met with in the analysis of agricultural products makes no appreciable change in the iodometric results." The use of molybdic acid to speed up the hydrogen peroxide potassium iodide reaction to such a point that subsidiary reactions do not take place during the time occupied in the analytical use of the main reaction is not possible in the presence of phenolic reducing substances; but it was found that the presence of considerable concentrations of pyrogallol appeared to slow down only slightly the liberation of iodine equivalent to the added hydrogen peroxide, but to retard materially the liberation of any excess iodine. "Quantitative results may therefore be secured in this manner, apparently for the reason opposite to that obtaining in the presence of molybdic acid. Ordinary phenol acts as does pyrogallol but not to an extent sufficient to give quantitative results.

"The addition of pyrogallol in the iodometric titration is of advantage only when reducing substances of the same type are present in sufficient quantity to invalidate both the permanganate and the usual iodometric titrations, yet not in sufficient quantity to fill the role of the pyrogallol as described. To the authors the method is of importance because it permits the estimation of peroxide in the presence of small quantities of pyrogallol itself, but there are many agricultural products in the analysis of which the addition of pyrogallol may at least increase the 'factor of safety.'"

The procedure outlined was found especially applicable to the determination of very small quantities of hydrogen peroxide in that "with small quantities of liberated iodine no reduction of the iodine by the pyrogallol takes place for one or two hours. This is not the case, however, with greater iodine concentrations."

Determination of peroxidase in agricultural products, A. K. Balls and W. S. Hale (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 445–453*).—The authors' method, mentioned on page 296, for determining hydrogen peroxide in the presence of pyrogallol and of other powerful reducing agents "permits the estimation of the ferment peroxidase in a new and easier manner, based upon the amount of hydrogen peroxide decomposed by the enzyme.

"The method is rapid and comparatively simple, and it has the advantage that the effect of peroxidase may be measured on any substance which is not oxidized by hydrogen peroxide alone, whether this substance gives rise to colored oxidation products or not. There is an added advantage in selecting pyrogallol as the test substance, since . . . the results are not affected by catalase, which is almost always found in agricultural products. It is thus possible to determine catalase in the presence of peroxidase, and peroxidase in the presence of catalase."

The original should be consulted for working detail.

Semimicro determination of carbon and hydrogen, E. P. Clark (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 414–418*).—The author describes, in a contribution from the U.S.D.A. Bureau of Chemistry and Soils, an apparatus and procedure permitting the accurate combustion analysis of a sample of the order of magnitude of from 20 to 25 mg. Specifications and working drawings for a combustion furnace adapted for such determinations are presented. The combustion reagents used in the tube include a pumice supported cerium dioxide catalyst prepared by saturating 3 g of 12-mesh pumice with a solution of 5 g of cerium nitrate in 12 cc of water and evaporating on a water bath, with stirring sufficient to prevent caking, followed by a slow heating to 550° C. in the tube in a current of oxygen. Lead chromate and cupric oxide are also used in the tube in a manner essentially similar to that of their use in the full-sized apparatus.

The full combustion procedure is detailed.

Rapid colorimetric determination of total carbon and nitrogen in the same sample, E. M. Emmert (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 424–427, figs. 2*).—With an error reaching +1.23 percent of the carbon and of —1.74 percent of the nitrogen in picric acid, —1.32 percent of the carbon and —2.27 percent of the nitrogen in sulfanilic acid, the author of this communication from the Kentucky Experiment Station determined nitrogen and carbon simultaneously by oxidizing a sample requiring from 1 to 5 g of sodium chlorate, collecting and estimating the nitric acid colorimetrically after boiling out the chlorine evolved with it, and precipitating the considerable chloride content with silver sulfate; the carbon dioxide by measurement of its volume after absorbing its chlorine content in potassium iodide solution.

"If interference in the yellow nitrate color occurs from some compound other than chloride acting on the phenoldisulfonic acid, use NaOH in excess to neutralize the phenoldisulfonic acid, make the yellow solution to volume, add about a gram of calcium hydroxide and shake with the solution a few minutes, and filter the solution. The foreign color usually disappears and a good color comparison may be made."

The determination of lactic acid, T. E. Friedmann and J. B. Graeser (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 291–308, fig. 1*).—The authors describe a procedure for the preparation of lithium lactate, which salt is chosen as a calibrating standard in preference to zinc lactate because the lithium salt crystallizes in the anhydrous state and is not hygroscopic; propose the use, for titrating the aldehyde-bound bisulfite and for removing the free bisulfite, of dilute iodine solutions prepared from iodate solutions, and the use of colloidal manganese dioxide for the oxidation of the lactic acid to acetaldehyde, together with other minor alterations in the bound bisulfite titration method for determining lactic acid; and detail their procedure for determining the acid in various biological materials, discussing a number of factors capable of influencing the accuracy of the results. A striking improvement in the recovery of known quantities of lactic acid was obtained by adding manganese sulfate to the oxidation reaction-mixture.

A bicolorimetric method for the determination of methemoglobin, B. B. Clark and R. B. Gibson (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 205–208*).—This contribution proposes a method based on the use of two standards. The methemoglobin standard is prepared by treating the diluted blood with freshly prepared potassium ferricyanide solution. The carboxyhemoglobin standard is prepared by treating the blood with an ammoniacal solution of sodium hydrosulfite and carbon monoxide, by which any methemoglobin present is converted to carboxyhemoglobin. The unknown is saturated with carbon monoxide. Comparison is made in a Hastings bicolorimeter.

"The chief difficulty to be encountered in matching the colors is a slight turbidity which sometimes develops, particularly with high concentrations of methemoglobin. This is easily remedied, however, by centrifuging all of the solutions before making comparison. For this reason the solutions are usually prepared in 15-cc centrifuge tubes."

Indirect colorimetric method for the determination of calcium, E. M. Emmert (*Plant Physiol., 8 (1933), No. 3, pp. 469–473*).—The author proposes to determine calcium by precipitating calcium phosphate in the presence of a known excess of the phosphate ion, reducing the phosphomolybdate formed from the phosphate remaining in solution by means of the 1-, 2-, 4-aminonaphtholsulfonic acid reagent of Fiske and Subbarow (E.S.R., 55, p. 310) for the colorimetric estimation; the paper being a communication from the Kentucky Experiment Station.

It is admitted that "if the amount of phosphate in the sample is large as compared with the calcium present, the method is not very accurate, since the reduction in color by the calcium will be too small." Adding a known quantity of calcium sufficient to reduce the phosphate color to a convenient intensity and subtracting the added calcium from the total found is said to overcome this source of inaccuracy, however. It is also considered that "aluminum and most other metals likely will act similarly to iron and not interfere, although if some such elements are present in significant amounts their effect on phosphate in alkaline solution should be tested."

Attention is directed to the decrease of color intensity with increasing quantities of the element to be determined as a means to a high degree of accuracy.

A study of the accuracy of the McCrudden method for calcium and magnesium in biological materials, D. E. H. Frear and O. J. Kahlenberg (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 85–95*).—The authors report in a contribution from the Pennsylvania State College the modification of the McCrudden method (E.S.R., 23, p. 9) for the determination of calcium and magnesium in biological materials to include fusion of the ash with anhydrous sodium carbonate. From data obtained with and without the inclusion of this fusion, it appeared that there are considerable quantities of calcium and magnesium undetermined in samples of some materials when the original McCrudden method is followed. Recovery tests indicated that the fusion procedure allows the operator to secure 100 percent recovery of these elements added to samples of various materials. The greatest error in the McCrudden method appeared in the analyses of samples of grain mixtures and hays. Analyses of samples of dried cow excreta showed variable errors, which had a tendency to become less when a greater proportion of the calcium and magnesium in the excreta was derived from concentrated calcium supplements in the feed.

Collection tables for dextrose and lactose in the presence of sucrose for use in the Lane-Eynon method, J. Fitelson (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 624, 625*).—"The sugars used . . . were recrystallized, and the quantities were corrected for moisture and ash content. Ten g of sucrose yielded 33.4 mg of reduced copper by the Herzfeld method, which indicated the absence of appreciable quantities of invert sugar. The tables presented were calculated from the carefully determined data by the method of least squares."

Figures for the sucrose-dextrose ratios 2:1, 4:1, 8:1, and 20:1 are provided, both for 10- and 25-cc portions of the Soxhlet solution. In the lactose table the sucrose-lactose ratios 3:1, 6:1, 10:1, 12:1, 15:1, and 20:1 are likewise provided for.

The estimation of sugars in chocolates containing dextrose, J. Fitelson (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 618–624*).—In a contribution from the U.S.D.A. Food and Drug Administration, the author presents a qualitative, or roughly quantitative, test for the presence of dextrose in milk chocolate, this test being based upon the use of Barfoed's reagent; a polariscopic procedure for the determination of sucrose; and combined optical and reduction methods for estimating dextrose and lactose. "Dextrose is calculated most accurately from the results secured by copper reduction methods, after correction has been made for the 'sucrose effect', by subtracting the dextrose equivalent of the lactose. Lactose can be accurately determined by copper reduction after fermentation of other sugars by yeast. A correction of 0.35 percent must be subtracted from this result owing to the presence of nonfermented reducing substances in the yeast and chocolate."

Approximation of the milk solids of a milk product by means of its citric acid content, B. G. Hartmann and F. Hillig (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 427–431*).—Out of 58 samples of bottled milk taken from wagon deliveries in 14 large cities, the authors of this contribution from the U.S.D.A. Food and Drug Administration found, from a study of the figures furnished by collaborators, that 5 samples contained 0.14 percent of citric acid, 16 samples 0.15, 20 samples 0.16, 14 samples 0.17, 2 samples 0.18, 1 sample 0.19 percent, the average thus being 0.16 percent. Further, "the calculated solids content of fluid whole milk was found to be 11.9 percent on the average. Formulas for calculating the milk solids of an evaporated or sweetened condensed milk are presented. Formulas for calculating the original solids of the milk used in the production of commercial milk products are defined."

A need for caution in the application of such a method to the estimation of the citric acid content of certain products was found, however, since "in the case of skimming in the process of standardization an evaporated milk of normal citric acid content would be interpreted as having the full quota of milk solids of average fat content. To be assured that overskimming has not been practiced a fat determination is essential."

Estimation of milk solids in bread, B. G. Hartmann and F. Hillig (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 431–435*).—The authors applied the citric acid method for the determination of milk solids essentially as in the preceding study. An air-dried sample of 25 g of bread was used, and, although bread made without the addition of any milk solids showed either no citric acid at all or only a trace, it was found that in the case of milk breads 2.5 mg must be subtracted from the citric acid found in the (4/5) aliquot taken from the 25-g sample. They explain that experience with the method "has shown that at least 1 mg of pentabromacetone in excess of saturation is necessary to give a positive test (trace) for citric acid", and calculate the correction named from this fact and the quantitative relations involved in the prescribed manipulations.

Determination of lactic acid in milk and milk products, B. G. HARTMANN and F. HILLIG (*Jour. Assoc. Off. Agr. Chem., 16 (1933), No. 3, pp. 435–445, fig. 1*).—A method for the determination of the lactic acid content of milk and milk products in which the acid is oxidized to oxalic acid with alkaline permanganate is described in a contribution from the U.S.D.A. Food and Drug Administration. In this procedure the adsorption of lactic acid in the casein precipitate is reduced to a minimum; manganese is removed as the sulfide; and the precipitation of calcium oxalate is expedited by shaking with glass beads. The liquid extractor developed was shown to be highly efficient, permitting the recovery of 98 percent of lactic acid in less than 3 hours. The results obtained in the investigation show that the method is accurate.

The potentiometric titration of strongly colored fruit solutions containing added phosphoric acid, A. GAINES, JR. (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 617, 618*).—In certain fruit juices containing, in addition to phosphoric acid, excessive quantities either of natural or of artificial color the author of this contribution from the U.S.D.A. Food and Drug Administration found the lead acetate clarification method incapable of removing enough of the color to permit titration.

With respect to colors it was shown that none of the permitted food colors interferes with potentiometric titration by means of the quinhydrone electrode; and in the case of the phosphoric acid it was shown that both this acid and the fruit acids may be precipitated by the lead acetate method with the liberation of corresponding quantities of acetic acid without interfering with the accuracy of the determination. The trials described indicate that "the quinhydrone electrode is satisfactory for this titration and may be used when the solution is highly colored and contains added phosphoric acid."

Improved form of automatic percolator, L. E. WARREN (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 629–632, fig. 1*).—Features of the apparatus described are that it is simply made in any convenient size, and operates in such a manner that the hot vapors of the solvent rising from the boiling flask surround and heat the extraction vessel into which the liquid solvent is dropping from the condenser, thus providing for a hot extraction of a column of material placed between layers of sand in the inner tube. The design is shown in a drawing, and dimensions of two sizes of the apparatus are specified.

New methods in microscopy, G. L. KEENAN (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 626–629*).—The author outlines crystallographic methods, involving the use of the polarizing microscope, for the determination of various optical properties of crystallizable substances, suggesting the analytical application of these crystallographic methods.

Thermal death points of molds and yeasts found in a grape juice plant, F. W. FABIAN (*Fruit Prod. Jour. and Amer. Vinegar Indus., 12 (1933), No. 11, pp. 327–329, 347*).—Determinations reported in a contribution from the Michigan Experiment Station showed 11 molds isolated from grape juice bottlers' piping and machinery and cultures from moldy juice to vary rather widely in thermal death point and in lethal exposure period at given temperatures. *Penicillia* were generally more resistant to heat than *Mucors*. *Poecilomyces varioti*, the most resistant form encountered, was not killed by 10 minutes exposure to a temperature of 65° C., whereas the ascospores of all the yeasts tested were killed by a 65° temperature in 5 minutes. Juices carboy-stored for several years yielded cultures less heat resistant than cultures from juices stored only a few months.

Pasteurization investigations, W. V. Cruess, H. Aref, and J. H. Irish (*Fruit Prod. Jour. and Amer. Vinegar Indus., 12 (1933), No. 12, pp. 358, 359, 377*).—Spores of certain *Penicillium* species survive temperatures of from 175° to 180° F. in the experiments reported in this contribution from the University of California; and the present practice of high temperature pasteurization is considered necessary for the preservation of fruit juices unless these be carbonated, packed in "vacuum" or in nitrogen, or put up in tin containers.

Pasteurizing at 140° for 30 minutes sufficed for the preservation of heavily yeast- and mold-inoculated juices if these were (1) carbonated before bottling; (2) treated with, and sealed in a "vacuum"; (3) if the reduced pressure were restored with nitrogen and the juices charged with nitrogen during bottling; and (4) if the juice was packed in plain tin cans.

"At this temperature the fresh flavor was retained. Sliced fruits in lightly acidified light sirup kept perfectly when pasteurized at 140° in cans. Tomatoes also kept well under similar treatment" (with the use of slightly acidified dilute brine).

AGRICULTURAL METEOROLOGY

A review of recent advances in meteorological research, H. H. Kimball (*Bul. Amer. Met. Soc., 14 (1933), No. 8–9, pp. 185–188*).—The principal subjects discussed briefly in this article are the polar-front theory of Bjerknes and the vertical temperature distribution in the atmosphere. It is stated that while the general principles enunciated by Bjerknes seemed to apply generally in temperate zones, "it is not surprising that equations and graphs developed for Norway, which has the Atlantic on its immediate west, do not apply to the United States with a great mountain barrier near its western border." Referring to the other subject, it is stated that "our present knowledge of all the factors involved is hardly sufficient to enable us to compute with a high degree of accuracy the atmospheric temperatures at heights in excess of those at which it is measured."

Sun spots and weather, C. G. Abbot (*Smithsn. Misc. Collect., 87 (1933), No. 18, pp. 10, figs. 5*).—This article presents and briefly discusses data bearing on the relation of variations in sun spots and solar radiation to weather and weather forecasting, from which the author draws the following conclusions:

"(1) The principal departures from normal climates which comprise 'weather' are due primarily to a group of periodic variations of the sun's radiation rather than to terrestrial complexities, as has been generally supposed. (2) Sun spots are associated with important modifications of weather not hitherto recognized. (3) Important periodicities in solar variation have their least common multiple in 23 years. As a consequence, weather repeats itself in all parts of the world with 23-year intervals. This period agrees with Hale's discovery of the double sun-spot period cycle in the magnetic condition of the sun. (4) At many stations this cycle in weather enables us to forecast general conditions of temperature and precipitation for many years in advance. Accurate seasonal predictions would require a more complete knowledge of the causes of shifts of phase in weather periodicities than is yet available."

Past rainfall of certain parts of Arizona and New Mexico deduced from growth rings of long-lived trees, E. V. Newnham (*Sci. Prog. [London], 28 (1933), No. 110, pp. 284–286*).—The work of Douglass on estimating the rainfall of historic and prehistoric times from measurements of the annual growth rings of trees, particularly *Sequoia gigantea*, is briefly commented upon with quotations and citation of references. Attention is called especially to the fact that correlation of tree rings with drought periods is complicated by variations of growth rate with age of tree and incidence of insect attack and forest fires. "These disturbing factors appear, in fact, susceptible to other than irregular local 'chance' variation, and there is no obvious way of deciding how much they have altered generally over the entire area." "It is difficult for anyone who has not been intimately associated with this work to form an accurate notion of the reliability of the method. . . . This uncertainty, however, probably has little effect on that part of the work which deals with periodicities in rainfall of length not exceeding a few decades."

Snow surveying: Its principles and possibilities, J. E. Church (*Geogr. Rev., 23 (1933), No. 4, pp. 529–563, figs. 24*).—This article explains at some length the principles, methods, and practical applications of snow survey as developed as a result of many years' study of the subject by the Nevada Experiment Station. The practical value of the snow survey as a basis for forecasting stream flow and probable supply of water for irrigation, power, and other purposes is emphasized. Factors which affect the accumulation and melting of the snow cover are also discussed. "Snow surveying had a spiritual birth in love of winter nature, and its springs have been maintained also by the interests of pure science and human service. The present need of the 'science' of snow surveying, as it is generously designated, is detail." Directions in which snow surveying may be improved and its practical usefulness increased are indicated. "Snow survey projects are seeking cooperation beyond their national boundaries. . . . International cooperation seems propitious", and steps are being taken to bring this about.

June temperature indicates corn maturity in Iowa, C. D. Reed (*Bul. Amer. Met. Soc., 14 (1933), No. 8–9, pp. 199–202, fig. 1*).—Confirming previous conclusions, additional evidence is given to show that "whether or not the average temperature of June is above or below 67° F. largely determines the extent of autumn frost damage to corn in Iowa." The author has found that "all of the outstanding frost damage came in years when the June temperature was well below 67°."

Tomatoes, berries and other crops under continuous light in Alaska, G. M. Darrow (*Science, 78 (1933), No. 2025, p. 370; abs. in Sci. News Letter, 24 (1933), No. 656, p. 297*).—Attention of those interested in light studies with crop plants is called to "the wealth of information in the Alaskan stations' reports on the response of many different vegetables, flowers, and field crops in regions of extremely long days and of continuous light."

The influence of rainfall on the yield of mangolds at Rothamsted, R. J. Kalamkar (*Jour. Agr. Sci. [England], 23 (1933), No. 4, pp. 571–579, figs. 2*).—Continuing earlier work on other causes of variations in the yield of mangolds (E.S.R., 69, p. 647), the influence of rainfall was studied by the statistical method developed by Fisher (E.S.R., 53, p. 14). The general conclusions reached from this study were as follows:

"An additional inch of rain above the normal during the period extending from the middle of March to about the end of May is harmful, possibly because of the difficulty in securing a proper tilth and delay in sowing, which results in a shortening of the growing period. The yield appears to be benefited by an additional inch of rain above the normal particularly during the months of June and July."

The Canadian climate, C. E. Koeppe (*Bloomington, Ill.: McKnight & McKnight, 1931, pp. [6]+280, figs. 104*).—This book shows the broad features of the climate of Canada and Newfoundland as a whole and seasonal characteristics in more detail on a regional basis. Data from a variety of sources have been brought together, including, among others, records of explorers and scientific expeditions and missionary enterprises and the like, but the chief source has been the original records of the Meteorological Office at Toronto. The human and agricultural significance of the data is brought out with unusual fullness and interest. Good illustrations and an extensive bibliography add to the interest and value of the book.

The climatic regions of China, B. B. CHAPMAN (*Univ. Nanking, Col. Agr. and Forestry Bul. 3, n. ser.* (*1933*), *pp. 77, figs. 29*).—This is a preliminary report of the China land utilization study carried on under the auspices of the University of Nanking, which arranges and classifies the available meteorological data to present the most typical and valuable of it in easily accessible form and to show how the remainder may be found. The data are arranged by climatic regions with brief comments, and the leading climatic characteristics of the different regions are briefly described.

Monthly Weather Review, [May–June, 1933] (*U.S. Mo. Weather Rev., 61* (*1933*), *Nos. 5, pp. 129–158, pls. 8, figs. 3; 6, pp. 159–187, pls. 15, fig. 1*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 5.—Droughts in Arkansas, by H. S. Cole (pp. 129–140); Dynamical Pressure Effect on the Friez-Type Aerometeorograph, by L. P. Harrison (pp. 140, 141); Analysis of the Precipitation of Rains and Snows at Mount Vernon, Iowa, by S. F. Williams and O. K. Beddow (pp. 141, 142); and Plan for Direct Call to Ships by Radio for Weather Reports during Hurricane Season (reprint) (pp. 142, 143).

No. 6.—Floods of March to June 1933 in the United States, by R. T. Zoch (pp. 159–165); History of the Application of Meteorology to Aeronautics with Special Reference to the United States, by W. R. Gregg (pp. 165–169); Mountain and Valley Atmospheric-Dust Measurements, by I. F. Hand (p. 169); Remarkably Low Humidities Aloft over San Diego, Calif., by D. Blake (p. 170); and Upper Winds at Reno, Nevada, by A. R. Lowery (pp. 171–173).

SOILS—FERTILIZERS

[Report of progress in soil fertility studies, 1919–32, on Indiana Station experiment fields and farms], A. T. WIANCKO ET AL. (*Indiana Sta., Expt. Farms Rpts., Herbert Davis Forestry Farm, 1923–32, pp. 1–3; Huntington Field, 1919–28, pp. 1–3, and 1919–32, pp. 1–3; Jennings Co. Field, 1921–32, pp. 1–7, fig. 1; Pinney-Purdue Field, 1920–32, pp. 1–6, 7, 8; Purdue-Vincennes Farm, 1925–32, pp. 1–6; Sand Field, 1924–32, pp. 1–5, 7, 8*).—These reports contain in each case briefly summarized recommendations under the heading How to Treat This Kind of Land and an outline of the general fertility test and a tabular statement of results. The report on the Jennings County Field also gives results on row fertilization of corn, relative merits of various liming materials, and a tile drainage experiment. The report on the Pinney-Purdue Field also gives results of a test of liming materials and a muck-soil fertility test. The report on the Purdue-Vincennes Farm also gives results of a nitrogen materials test and time and rate of applying nitrate of soda on wheat. The report on the Sand Field also gives results on a nitrogen materials test, the use of farm manure, and an alfalfa fertilization experiment.

[Report of progress, Soils and Crops Experiment Farm, 1915–32], A. T. WIANCKO and R. R. MULVEY (*Indiana Sta., Soils and Crops Expt. Farm, Rpt., 1915–32, pp. 1–14, figs. 2*).—Results of experiments on this farm, deemed representative of most of the soils of the northern two thirds of the State, with the exception of the Kankakee Valley, are briefly noted. The topics discussed include a comparison of cropping systems on one-half acre plats, the place in the rotation to apply manure, cornstalks plowed under v. left to decay on the surface, grain farming v. livestock farming, quantitative rock phosphate experiment, a general fertility experiment, comparison of different phosphates, an alfalfa fertilization experiment, a cross-cropping experiment, a test of nitrogen-carrying materials for top-dressing wheat in spring, and date and rate of top-dressing wheat with nitrogen.

[Soil fertility investigations of the Pennsylvania Experiment Station] (*Pennsylvania Sta. Bul. 293 (1933), pp. 6, 25–27, figs. 2*).—Data are briefly noted on the Jordan fertility plats; the liming of Dekalb soils, by J. W. White, C. D. Jeffries, and F. J. Holben; the drainage of Volusia soils, the value of blast furnace slag as a source of agricultural lime, and the relative value of limestone of different degrees of fineness, all by White; and a field test of different carriers of phosphorus, by D. F. Noll.

Soil survey of Delaware County, New York, C. LOUNSBURY ET AL. (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1930, No. 7, pp. 31, pl. 1, fig. 1, map 1*).—Delaware County occupies an area of 927,360 acres in the southeastern part of New York. The topography of the county is that of a deeply dissected plateau sloping from an elevation of about 3,000 ft. to somewhat less than 2,000 ft. above sea level. Drainage flows to the two headwater forks of the Delaware River and to the Susquehanna River.

Of the 22 soil types, here classified as 16 series, Culvers silt loam, covering 18.7 percent of the total area surveyed, is the most extensive. This is followed in areal importance by Lackawanna silt loam and stony silt loam, each 13.2 percent of the total area, 12.6 percent of rough stony land valuable mostly for its hardwood forest production, 11.7 percent of Walton silt loam, and 11 percent of Culvers stony silt loam.

The survey was made in cooperation with the Cornell University Experiment Station.

Chemical and microbiological factors in some Quebec soils, R. R. MCKIBBIN and P. H. H. GRAY (*Canad. Jour. Res., 7 (1932), No. 3, pp. 300–327, pl. 1*).—The authors of this contribution from McGill University define the major soil groups of the area in question on the basis of organic matter relations and variations in colloidal mineral matter, arriving in this manner at the eight main classifications: Heavy clay, sandy clay, lowland podsol, upland podsol, brown earth, orchard soil, lowland muck swamp, and upland muck swamp. The data concerning these soils, obtained in the investigation reported and discussed in the present paper, include the moisture content of the soil as collected and its hygroscopic moisture content, the soil pH value, the lime requirement, the loss on ignition, and bacterial and fungal numbers.

The paper contains discussions (1) of the soil groups set up by the authors and (2) of the microbiological factors in surface soils.

The accumulation and availability of phosphorus in old citrus grove soils, O. C. BRYAN (*Soil Sci., 36 (1933), No. 4, pp. 245–259, pls. 2*).—The author calls attention to the high and presumably excessive rate of phosphate application (1,500–3,000 lb. per acre per year) commonly practiced in the management of citrus grove soils—for the most part sands containing relatively little of the iron, aluminum, and calcium compounds to which the phosphate-fixing power of soils is usually attributed—and presents the results of his determinations of the total, available, and water-soluble phosphate content of the soils of citrus groves in various stages. With respect to the Florida soils examined, these results indicated that "the total, available, and water-soluble phosphorus increases with the age of the groves. Although the accumulated phosphorus is not unusually high, the available and water-soluble phosphorus is very high compared to that of soils in other humid regions. The concentration of phosphorus in the soil solution was also found to be high compared to other humid soils."

Of the fixation of phosphates in the citrus grove sands it is stated that "these sandy soils have a low phosphate fixing power—500 to 6,000 lb. of superphosphate per acre 6 in. Plant response studies (annual crops and citrus seedling under controlled conditions) showed no stimulation from added phosphates on soils from old seedling groves. All of the data tend to indicate that the phosphate requirements of the citrus soils (sands) of Florida are much less than the common practice would indicate."

Lysimeter investigations.—III, Mineral and water relations and final nitrogen balance in legume and non-legume crop rotations for a period of 16 years, R. C. Collison, H. G. Beattie, and J. D. Harlan (*New York State Sta. Tech. Bul. 212 (1933), pp. 81, fig. 1*).—This bulletin reports, in continuation of previous contributions (E.S.R., 67, p. 220), an investigation of the water and nitrogen relationships both of legume and of nonlegume rotations grown in 4 complete cycles during 16 years on Ontario loam and on a hill soil considered probably to be of the Lordstown series and "characteristic of many of the hill lands of southern New York." It deals especially with the following relations: The effects of crop rotations, fallow periods, soil type, soil depth, and fertilization on such factors as water utilization, crop growth and sequence, nitrogen losses, nitrogen fixation, and nitrogen balance, and also on mineral outgo and mineral balance.

"Perhaps the outstanding results are those dealing with nitrogen gains and nitrogen deficits in soils growing legume and nonlegume crops for the 16-year period. The relationships of other mineral elements are secondary only to those of nitrogen. The depth of soil column was also found to have some important effects on some of the above relations."

Among numerous significant findings is mentioned the observation that the application of nitrogenous fertilizer to alfalfa enabled the crops of the alfalfa-grain rotation to produce dry matter with a smaller water utilization. About an inch of water per year was thus conserved. It is noted also that when crop yields only are considered, no appreciable soil deterioration could be detected in either soil during the 4 rotations covering 16 years.

From an examination of the leachings and from other data it was learned that only from 3 to 9 percent of the total potassium removed from the soils was lost in drainage, the remainder in the crops; that from 70 to 90 percent of the sodium removed from the soils was lost through drainage; and that the ratio of calcium removal in drainage to that in crops was nearly 1:1 for alfalfa-grain rotations, but as wide as 8:1 for timothy-grain rotations. "Large amounts of calcium were removed from the high lime subsoil of the Ontario loam. Application of nitrogen and the presence of excess nitrogen not used by crops increased the calcium in the drainage water. Applications of calcium to hill soil, a lime-deficient soil, in the form of calcium carbonate and superphosphate at the rate of about 2,200 lb. of calcium per rotation of 4 years, more than maintained soil calcium." About 80 percent of the total magnesium lost from the soils was in the drainage water. Phosphorus removed from the soils was lost entirely through crop removal, the drainage water being practically free of this constituent. The crops removed comparatively small quantities. Applications of 560 lb. of 16 percent superphosphate per acre in the odd years throughout the experiment resulted in just about balancing phosphorus removal from soils in alfalfa-grain rotations and increasing this element somewhat in soils in timothy-grain rotations. Phosphorus applications produced larger crops with consequently larger removal of this element from the soil.

The nitrate nitrogen present in two soil types under various treatments, A. O. ALBEN, B. G. SITTON, R. D. LEWIS, and J. L. PELHAM (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 46–49*).—Working with two contrasting soil types, an Orangeburg fine sandy loam depleted of organic matter and an alluvial Red River soil of the Yahola series, greater amounts of nitrates were found throughout the season in the latter, as was expected because of the larger content of organic matter. Observations on the downward movement of nitrates showed them present in season at all depths up to 24 in., the maximum reached. The smallest amounts were in plowed, unfertilized soils. Where fertilizer was applied the amount of nitrates at any given time was increased directly in proportion to the nitrogen supplied.

Some factors influencing nitrogen fixation, J. E. GREAVES (*Soil Sci., 36 (1933), No. 4, pp. 267–280*).—Finding that "the nitrogen fixed in soil and in soil extract media by *Azotobacter chroococcum* is considerably greater than that fixed in the synthetic media used at the present time for the culturing of this micro-organism", the author of this contribution from the Utah Experiment Station devised a culture medium of known constituents in which the nitrogen fixation effected by *A. chroococcum* was as great as that occurring in a soil extract medium and "nearly three times as great" as that accompanying the growth of the same species in Ashby's basal solution. Media of the new type permitted also "a luxuriant growth" of the organism in all cases.

As a result of extensive experiments with elements which have been found in soil solutions it was found that "boron, aluminum, copper, bromine, zinc, titanium, selenium, and tellurium are nonessential to *Azotobacter*, and, even when used in small quantities in liquid media, fail to stimulate *A. chroococcum*. Copper and zinc were found to be toxic when present in minute quantities.

"Manganese, iron, and iodine greatly stimulate nitrogen fixation when added to liquid cultural media. No evidence was obtained that they act by adsorption or that they render oxygen more available. The results point to the conclusion that they are essential elements used by this micro-organism in its growth or metabolism."

The form of the medium in which the maximum results were obtained consisted of a distilled water solution of monopotassium phosphate 0.02 percent, magnesium sulfate 0.02, sodium chloride 0.02, and calcium sulfate 0.01 percent, iron as ferrous sulfate 50 p.p.m., iodine as sodium iodide 40 and manganese as manganous carbonate 40 p.p.m., and mannitol 1.5 percent.

The character of the peat deposits of New York, B. D. WILSON and E. V. STAKER ([*New York*] *Cornell Sta. Mem. 149 (1933), pp. 20, figs. 2*).—Continuing previous studies (E.S.R., 67, p. 214), a survey of the peat deposits of New York indicated the presence of five distinct types of deposits representative of the peats of the Genesee-Orleans, Wayne, Oswego, Madison-Oneida, and Orange areas, respectively. Detailed profile descriptions and profile diagrams for each of these typical deposits are recorded.

"The profile most typical of the deposits studied consists of an upper layer of woody peat underlain successively with layers of fibrous peat and sedimentary peat resting on calcareous material. Deposits having upper layers of cat-tail peat, reed peat, or sedge peat occur less frequently. Only one cultivated deposit was found with an upper layer of *Sphagnum* peat.

"Most of the deposits are relatively high in calcium. They are also high in nitrogen, a large part of which is in combination with the lignin-humus complexes. The organic matter of each of the layers contains more hemicellulose than cellulose. The amount of each of these constituents is smaller in the organic matter of most of the layers than is the amount of the lignin-humus. The relative amounts of the organic constituents of the peat materials used in the investigation are not necessarily an indication of a particular kind of peat."

The character of a deposit and the kind of material underlying it were found to be closely related. "The nature of the material and its position with reference to cultivation are important factors in the selection of peat for agricultural purposes."

The occurrence of Azotobacter in peat soils of New York, J. K. and B. D. Wilson (*[New York] Cornell Sta. Mem. 148 (1933), pp. 15, pl. 1*).—Of 54 samples of peat soils, 53 of them acid in reaction, collected from 6 geographical locations in New York, air-dried, ground, and stored for 27 months before being examined for the presence of *Azotobacter*, 50 soils, representing the range of reaction pH 3.6 to 7.6, contained the organism, but in 4 of the samples, of which the pH values were 6.0, 5.5, 5.4, and 5.6, it was not found. There seemed to be no close relationship between the soil reaction and the presence of *Azotobacter*, the evidence presented indicating rather that the soil complex is more important in controlling the activity of the organism than is the soil reaction.

Soils containing carbonates and not naturally suited to the macroscopic colony growth of *Azotobacter* could usually be made suitable in this respect by adjusting the carbonate-phosphate ratio. "This can be accomplished by the addition of soluble salts containing phosphorus, by the addition of soluble salts containing phosphorus and certain basic materials, or by the addition of HCl, H_2SO_4, or H_3PO_4. A practical application of certain of these data may lie in the treatment of soils with flowers of sulfur in order to narrow the ratio of CO_3 to PO_4 so that the soils will be more productive."

The decomposition of hydrolytic peat products including ammoniated peat, I. C. Feustel and H. G. Byers (*U.S. Dept. Agr., Tech. Bul. 389 (1933), pp. 32, figs. 6*).—The rate of decomposition, when mixed with soil, of natural peats and of peat samples which had been subjected to solvent extraction, water, acid, and alkali treatment at ordinary, and at high temperatures under pressure was studied, the measurement of carbon dioxide evolution serving as the primary index of the rate of decomposition.

"The raw peats decomposed very slowly, whereas peat treated at ordinary temperature with 40 percent hydrochloric acid or at 150° C. under pressure with lime or ammonia decomposed quite rapidly, the maximum rate being approximately two thirds of the rate of sweetclover under the same conditions.

"Peat is capable of reacting with ammonia in such a way that relatively large quantities of nitrogen are added, yet only a fraction of the added nitrogen is ammoniacal in form. This reaction was studied at temperatures varying from 50° to 225° and for periods of time varying from 1 to 36 hours. The percentages of added nitrogen ranged from 2.83 to 5.78 on the basis of the dry product. There is apparently no relationship between the nitrogen originally present and the additional nitrogen taken up in the treatment. Lignin, sulfite-waste liquor from the paper industry, and soil organic matter were also found to respond to the ammonia treatment by showing increased percentages of nitrogen. Fertilizer pot tests with millet in quartz sand are believed to indicate that the possibilities of preparing a satisfactory nitrogenous fertilizer from peat by the action of ammonia are excellent." The immediate availability of the nitrogen of certain of the treated samples was found between 25 and 50 percent of that of inorganic nitrogen. The availability of the phosphorus in rock phosphate was apparently increased by the autoclaving process when the rock phosphate was added previous to the treatment with ammonia.

Peat (*Alaska Col. Sta. Bul. 2 (1932), pp. 4, 5*).—Comparisons of native peat with sodium nitrate and field peas as a carrier of nitrogen and a source of organic matter are briefly noted.

Some factors limiting the applicability of biological methods for determining the availability of plant food elements in calcareous soils, R. A. Greene (*Soil Sci., 36 (1933), No. 4, pp. 261–266*).—The *Azotobacter* method of Sackett and Stewart (E.S.R., 66, p. 616) having proved inapplicable for the determination of the phosphate requirements of the calcareous soils of Arizona (E.S.R., 68, p. 168), the author proceeds in the present paper to discuss the failure of the method under the special conditions named "in terms of more recent investigations to show why the method is so restricted in its application." He concludes in part that "the plant feeds upon H_2PO_4 [E.S.R., 66, p. 719], which occurs in greatest amounts in acid solutions. The optimum pH range for growth of *Azotobacter* lies within the range where H_2PO_4 occurs in greatest amounts. If a soil of high pH is well aerated, *Azotobacter* will develop and, by the production of CO_2 and organic acids, will lower the pH of the soil solution sufficiently to permit absorption of phosphate. In 'black alkali' soils, the addition of water in the preparation of the plaque results in anaerobic conditions. Consequently *Azotobacter* cannot develop, and as a result of the lack of CO_2 the insoluble carbonate-phosphate is not rendered available."

The effect of different colloidal soil materials on the efficiency of superphosphate, P. L. Gile (*U.S. Dept. Agr., Tech. Bul. 371 (1933), pp. 50, figs. 5*).—The influence of soils and soil colloids on the effectiveness of superphosphate applications was investigated by means of about 1,400 pot cultures in pure quartz sand, with and without the addition of 17 surface soils and 14 subsoils in quantities sufficient to add 1 percent of soil colloidal material.

Assigning the value 100 percent to the efficiency of superphosphate in the pure sand, "additions of some soils reduce the efficiency to 1 percent, whereas others raise the efficiency to 148 and 198 percent." Thirteen of the 14 subsoils tested imparted to the phosphate an efficiency lower than that observed in the presence of corresponding surface soils.

"The effects of surface soils on superphosphate correlate fairly well with the silica-sesquioxide ratios of the colloids present, soils containing colloids with high silica-sesquioxide ratios enhancing the efficiency of superphosphates and those containing colloids with low ratios depressing efficiency. The same is true of subsoil materials also."

Determinations of the effect of two purely organic colloids, activated charcoal and peat, indicated that these increase the efficiency of superphosphate and rock phosphate in pure quartz sand and that of superphosphate in sand and soil mixtures.

"The effect of a soil colloid on superphosphate seems to depend on several factors, namely, the degree to which the colloidal material is saturated with phosphoric acid, the silica-sesquioxide ratio of the colloid, the effect of the colloid on the H-ion concentration of the medium, and the content of organic matter. The relative importance of the different factors is believed to be in the order given, the first mentioned being most important. . . . The availability of rock phosphate, on the other hand, seems to be governed primarily by the H-ion concentration of the medium, but within the acid range other factors may influence the availability of this material."

The observed effects of soil colloids on superphosphate are discussed with reference to their relation to known laboratory methods of determining available phosphoric acid and to their bearing on actual fertilizer practice.

Granulation of fertilizers, W. H. Ross (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 632–635*).—This contribution from the U.S.D.A. Bureau of Chemistry and Soils discusses the caking, segregation, and drillability of fertilizers, together with various of such commercial methods for the avoidance of the two first named characteristics and the improvement of the third as shredding, compressing, graining, rotary drying, and the spraying of solutions or melts of the fertilizer to be granulated downward through a tower carrying a current of hot gases. It is noted that granulation is not always an added step in the manufacture, since it often replaces the grinding otherwise necessary.

AGRICULTURAL BOTANY

Textbook of general botany, F. A. F. C. Went (*Lehrbuch der allgemeinen Botanik. Jena: Gustav Fischer, 1933, pp. VIII+422, figs. 274*).—This is a German-language edition of the author's Dutch textbook of general botany, intended not only for use in that field, but also for pharmaceutics, medicine, agriculture, and chemistry. It presupposes a knowledge of the general fundamentals of physics and chemistry and an elementary knowledge of botany. Part 1—Morphology—includes chapters on cytology, histology, external morphology, developmental history (origin of primary tissues), secondary tissues, and experimental morphology. The chapters in part 2—Physiology—take up the general characters of living substances, nutrition, respiration, growth, movements, and reproduction in its various phases.

Subject and author indexes are provided, and selected bibliographies are given at the end of individual chapters.

The development of an out-of-door botanical laboratory for experimental ecology, E. A. Roberts (*Ecology, 14 (1933), No. 2, pp. 163–223, figs. 31*).—An account of the development of the Dutchess County (N.Y.) Botanical Garden at Vassar College as an outdoor laboratory for experimental ecology is presented, with lists of trees, shrubs, herbs, and ferns included in the several associations.

An apparatus for the ready determination of areas of compound leaves, R. E. Marshall (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 6, pp. 437–439, fig. 1*).—Finding in studies at the Michigan Experiment Station a high correlation ratio (0.959) between width plus length of end leaflets and areas of compound leaves of the black raspberry, an apparatus herein described with respect to structure and operation was devised for obtaining rapid and reasonably accurate measurements of compound leaf areas. The data obtained approximated in accuracy those secured with the planimeter. Since the same relationships did not exist between width plus length of end leaflets and compound leaf areas in fruiting and in young canes, it was found necessary to provide a calibrated scale for each.

Studies on the precipitin reaction in plants, I–III (*Jour. Arnold Arboretum, 13 (1932), Nos. 1, pp. 52–74, pl. 1; 2, pp. 285–296; 14 (1933), No. 2, pp. 118–197, figs. 4*).—Studies at the Arnold Arboretum are here reported.

I. *The specificity of the normal precipitin reaction,* K. S. Chester.—This paper describes a series of tests of the direct normal precipitin reactions in a number of families of woody plants for the purpose of determining the specificity of the reaction and its consequent relation to applications of the method in phylogeny and immunology.

"In general the results of the experiments performed indicate a clear-cut parallel between the systematic relationships as indicated by the precipitin reaction and the main trends of relationship as indicated by the conventional methods of taxonomy. The divergences from such a parallel are no greater than are found in the comparison of the relationships indicated by any two systematic methods. Uniform groups of plants are in general characterized by homogeneity in reaction and absence of mutual reactivity, whereas the reactions steadily increase as one passes farther from the type originally selected, reaching a maximum at a given distance from the type, and then again disappearing as the divergence of the plants hypothetically becomes too great to be expressed in reaction."

II. *Preliminary report on the nature of the "normal precipitin reaction,"* K. S. Chester.—This paper gives a condensed preliminary account of the author's investigations of the biochemical nature of this reaction.

III. *A biochemical analysis of the "normal precipitin reaction"*, K. S. Chester and T. W. Whitaker.—This paper reports an analysis of the normal precipitin reaction (precipitation reaction) in plants based on a study of the reactions in 45 species of woody and herbaceous plants. In preliminary tests of the reaction in certain woody plants demonstrating the high stability of the reaction in these plants, analysis showed this reaction to be a precipitation of calcium oxalate resulting from the addition of calcium and oxalate ions in two complementary extracts. This calcium oxalate reaction was found to account for 57 percent of the positive results in 4,000 tests made. By then eliminating the calcium oxalate reaction it was possible to detect the presence of three other types of reaction in the material studied, namely, an "*AB*" reaction characterized by the reactions of Rosiflorae with extracts of Solanaceae, an "*MN*" reaction resulting from the interreaction of certain Solanaceae with others of the same family, and an "*XY*" reaction occurring in tests between Oleaceae and Solanaceae. Principles *A* and *B* were found to be nonlipoid and nonprotein, but organic and of relatively high molecular weight. Principles *M* and *N* were also both organic and nonlipoid, *N* being apparently a relatively simple organic substance and *M* presumably a protein. *X* and *Y* were not tested in this connection. Of the reactions observed in the plants tested, the reaction *AB* accounted for 24 percent of the positive results observed, *MN* for 17 percent, and *XY* for 2 percent.

This work renders untenable the previously published immunological interpretations of the "precipitin reaction" in plants because of the widespread occurrence in the plants employed of simple, nonprotein reactions. On the other hand, the work tends to elucidate the earlier results regarding the specificity of the reaction and its occurrence in diseased plants. Experiments varying environmental and genetic factors showed the reactions to be relatively stable from plant to plant and from one environment to another. It is concluded that the work does not eliminate the possibility of demonstrating immunological reactions in plants by means of a precipitation technic, but provides a much sounder and more conservative basis for future work in this direction.—(*Courtesy Biol. Abs.*)

Precipitin-ring test applied to fungi, II, G. K. K. Link and H. W. Wilcox (*Bot. Gaz., 95 (1933), No. 1, pp. 1–34*).—Potent antisera and test antigens were prepared from 34 species and strains of fungi, using those fractions of their powdered mycelia which were soluble in 0.85 percent NaCl solution.

The fractions of some organisms exhibited sufficient specificity to permit differentiation, but in most cases cross precipitin reactions were so strong that identification was impossible. In a few cases absorption of precipitins differentiated fungi not separable by the precipitin test.

Supplementary studies indicate that the possession of common antigenic and haptenic substances by different organisms, as demonstrated by the precipitin absorption tests, may be in part responsible for the nonspecific precipitations obtained.

Though the procedure reported is not deemed invariably usable for identification of every one of the fungi tested, consideration of all reactions of every organism leads to the conclusion that each is a distinct serological entity.

On Azotobacter agilis (Beijerinck) [trans. title], A. J. KLUYVER and W. J. VAN REENEN (*Arch. Mikrobiol., 4 (1933), No. 2, pp. 280–300, figs. 7*).—Report is made upon new isolations of *A. agile* from ditch and canal water, and upon a comparative study of the *Azotobacter* species, *agile, vinelandii, chroococcum*, and *beijerinckii*. Both morphologically (in the exceptionally large dimensions of its cells) and physiologically (in its inability to utilize mannitol as a source of energy), *A. agile* was distinct from the three other species named. *A. agile* was shown to be capable of nitrogen fixation and, like other *Azotobacter* species, to be stimulated in this respect by the addition of small quantities of sodium molybdate.

It is suggested that *A. agile* may play an important part in the nitrogen cycle of the inland waters of the Netherlands.

The bacterium in Borrago officinalis [trans. title], M. VALLEGGI (*Bol. R. Ist. Super. Agr. Pisa, 8 (1932), pp. 401–410, figs. 4*).—A bacterial form frequently found in the soil has been isolated from the roots of *B. officinalis* and found to have proteolytic and amylolytic powers. The author concludes that it is beneficial to the plant. The organism belongs to the genus *Bacterium*, but differs from both *B. punctatum* and *B. blandineum*.

Physiologically balanced culture solutions with stable hydrogen-ion concentration, S. F. and H. M. TRELEASE (*Science, 78 (1933), No. 2028, pp. 438, 439*).—The results of the authors' study demonstrate that the use of a physiologically balanced culture solution provides an effective and practicable means of stabilizing the pH of the solution, and indicate that excellent growth of plants may be secured in a culture solution of this type if due attention is given to total concentration, as well as to relative proportions of solution constituents. This method is recommended for many different kinds of physiological studies in which culture solutions with controlled pH values are required, and it is deemed worthy of much greater emphasis than has been given to it in the literature of physiology, pathology, mycology, and bacteriology.

Intake and exosmosis of ions [trans. title], H. LUNDEGÅRDH and H. BURSTRÖM (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 18 (1933), No. 4, pp. 683–699, figs. 5*).—The paper is a study of the total intake and exosmosis of ions by wheat roots in single salt solutions of nitrates and chlorides of NH_4, K, Na, Ca, and Mg, with special reference to the CO_2 balance in the solution.

In nitrates the anion is more rapidly absorbed by the roots than the cation (except from NH_4NO_3). The excess of cations in the solution is balanced by CO_2 (partly dissociated as HCO_3) so derived from the root respiration as to render the solution from pH 5.8 to 6.2. The different cations-anions in the solution agree very well with the HCO_3 concentration calculated from the total CO_2 (determined) and pH. In chlorides the cation intake is equal to the anion intake or larger. In that case the pH is lowered, and C_H agrees with the anion excess in the solution. The conclusion is drawn that no other buffer substances are present than the respiration CO_2. In all cases the pH can be calculated from the anion-cation balance and the CO_2 content. At large excess of cations in comparison to anions in the solution the buffer action of the respiration is not sufficient to maintain a slightly acid reaction, and pH tends to increase. In chlorides, on the contrary, with anion excess in the solution and pronounced acid reaction (pH 3.6 to 4.4), the liberation of carbon dioxide from the reaction is held to a minimum.

The regulation of the CO_2 exosmosis cannot be explained by changes in permeability, the latter being determined by the intake of glucose and found equal in nitrate solutions and in the more acid chloride solutions. The relation between C and respiration is discussed with reference to the equilibrium between diffusion rate of CO_2 and difference in charge of solution and protoplasm. The buffer action of CO_2 is also studied in model experiments with bases and neutral salts. Some conclusions are included concerning the CO_2 balance in the soil.—(*Courtesy Biol. Abs.*)

The effect of nitrate supply on transpiration ratio in plants, L. A. T. Ballard (*Aust. Jour. Expt. Biol. and Med. Sci., 11 (1933), No. 3, pp. 161–176, figs. 10*).—The effect of nitrate in reducing transpiration ratio (ratio of water transpired to dry matter produced up to any point) is due not to an effect on the transpiration rate per unit weight of leaf, but to an effect on growth. This effect is such that at any point prior to that of harvest the ratio of the amount of dry matter produced after that point to the amount produced before it is, in most cases, greater as the nitrate supply increases. This causes a reduction in the transpiration ratio. The reduction is intensified by the fall with age in the transpiration rate per unit of plant, as a result of the fall in leaf weight ratio, for this has the effect of weighting the transpiration losses when the differences in percentage size, due to the growth phenomenon, are most marked. However, these reductions are partially, and in most cases more than, compensated for by an increase in the transpiration rate per unit of plant, as a result of an increase in the leaf weight ratio.

Absorption of potassium by plants as affected by decreased exchangeable potassium in the soil, E. L. Proebsting (*Jour. Pomol. and Hort. Sci., 11 (1933), No. 3, pp. 199–204, pls. 2*).—In this study, conducted at the Long Ashton Research Station, England, buckwheat and tomato plants grown in soils from which the exchangeable potash was exhausted as far as possible by physical means, developed normally. The subtraction of the total exchangeable potash at the beginning of the experiment from the sum of that absorbed by the plants and that remaining in the soil showed that the plants were able to utilize the nonexchangeable potash fraction. The tomato was considerably more potent in withdrawing potash from the soil than was buckwheat, indicating that species may vary widely in this capacity.

A contribution to the biochemistry of seed germination, with particular reference to Zea mays, R. C. Malhotra (*Jour. Biochem., 18 (1933), No. 2, pp. 173–197, figs. 5*).—The periodic quantitative changes in corn, wheat, and peas during germination were studied with particular reference to biochemical substances and calorific energy. Starch and hemicelluloses appeared to be utilized most, although fats were also consumed to some extent. Proteins were used only in peas. Sugars increased during germination, probably because of the breakdown of active polysaccharides in excess of their utilization. There was also a gradual decrease in calories per unit weight. Seedlings always weighed less than the initial weight of their seeds.

Study of changes in the reserve materials in the attached embryo and endosperm of corn suggested that during germination fats and heat energy decreased most in the embryo, although carbohydrates decreased also to some extent. In the endosperm, starch and hemicelluloses were used largely, while sugars showed no definite trend. The embryo contained a higher percentage of ash and nitrogen, neither of which was used by the growing seedlings. When corn embryos were previously isolated from their endosperms and allowed to germinate, their composition seemed to indicate that fats, starch, and hemicelluloses, as well as calories of heat, decreased during germination, while sugars did not behave in a definite manner. Ash and nitrogen remained approximately constant at the last day. Isolated corn endosperms, under conditions suitable for seed germination, showed change only in sugars which increased and starch which decreased. There was also some decrease in calorific energy, but no change in hemicelluloses, nitrogen, and ash, and extremely little in fats. The significance of changes in reserve materials and their application in seed, endosperm, and embryo are pointed out.

A contribution to the biochemistry of the wheat plant, R. C. Malhotra (*Jour. Biochem., 18 (1933), No. 2, pp. 199–205, figs. 3*).—Hard winter wheat was grown from September to June at St. Marys College, Kansas, and the composition of the plant at successive growth stages and the grain was determined.

Water was least during the early and late growth stages, oils were highest at maturity, and nitrogen was small at first but increased later. Sugar was at minimum at first, increased, and finally decreased. Starch was used by the plant in grain development. The grain differed little on May 31 and June 15, although the moisture decreased at the later date while the chemical constituents increased to some extent.

Relation of oxygen pressure and temperature to the influence of ethylene on carbon dioxide production and on shoot elongation in very young wheat seedlings, W. B. Mack and B. E. Livingston (*Bot. Gaz., 94 (1933), No. 4, pp. 625–687, figs. 5; abs. in Pennsylvania Sta. Bul. 293 (1933), p. 34*).—A review of literature on ethylene effects on plants and an account of some preliminary experiments performed by Mack lead the authors to the conclusion that ethylene influence seems to be generally dependent upon other environmental influences, as well as upon the physiological state of the treated plant material.

An experimental study is described involving rather definitely specified background or parameter conditions and four experimental variables, namely, temperature, oxygen pressure, time, and presence or absence of ethylene. Relations between ethylene effect on CO_2 production and on shoot elongation are considered, also the influence of oxygen pressure and temperature on ethylene effect. The results from the control series without ethylene were presented by Mack in an earlier paper (E.S.R., 68, p. 28).

The influence of ethylene on shoot elongation was to retard in most tests, and the nature and degree of this influence was related to oxygen pressure and to the concomitant influence of ethylene on CO_2 production. The oxygen pressure of ordinary air consistently gave remarkably low rates of CO_2 production both with and without ethylene, and it also gave most pronounced ethylene retardation of shoot elongation and little or no ethylene effect on CO_2 production. The only tested combination of temperature and oxygen pressure that gave considerable acceleration of both CO_2 production and shoot elongation was the combination of 20° and 16 percent. This acceleration amounted to 15 percent for CO_2 production and 20 percent for shoot elongation. It is deemed apparent that no scientifically useful conception of ethylene influence on plants can be formed without consideration of the nonethylene influences, such as oxygen pressures, that operate along with ethylene in each experimental test.

A bibliography of 63 titles is presented.—(*Courtesy Biol. Abs.*)

The .SH radical and some other sources of sulfur as affecting growth of isolated root tips of wheat seedlings, P. R. White (*Protoplasma, 19 (1933), No. 1, pp. 132–135, figs. 2*).—NaSH proved slightly beneficial to growth of isolated root tips cultured in a balanced salt solution plus dextrose and yeast extract. K_2S was without apparent effect, while $(NH_2)_2CS$ and NH_4CNS were definitely detrimental.—(*Courtesy Biol. Abs.*)

Change in the glutathione content of potato tubers treated with chemicals that break the rest period, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 331–350, figs. 2*).—Glutathione was isolated from the juice of potato tubers treated with ethylene chlorohydrin. As determined by the sulfur-reduction method, all effective chemical treatments so far investigated produced significant increases in the glutathione content of the tissue of dormant tubers, although a quantitative relation could not be shown between a chemical's effectiveness and its capacity to increase glutathione. Ethylene chlorohydrin, ethyl alcohol, acetaldehyde, and chloral hydrate increased the glutathione content more effectively than potassium thiocyanate and thiourea. Ethylene chlorohydrin and ethyl alcohol treatments also increased the sulfhydryl in gladiolus corms. The capacity of a chemical to increase the glutathione content of potato tubers was correlated with its capacity to increase the pH of the expressed juice. Ethylene chlorohydrin treatments of potato tubers caused a decrease in the sulfuric acid content of expressed juice. Adenine also was isolated from potato juice.

A biochemical study of the formation of the oil in niger seed (Guizotia abyssinica), D. L. SAHASRABUDDHE and N. P. KALE (*Indian Jour. Agr. Sci., 3 (1933), No. 1, pp. 57–88, fig. 1*).—The oil is formed from the carbohydrates in the seed. Lower saturated acids are formed first and then the higher and unsaturated acids. The conversion of carbohydrates to fatty acids in the seed is believed to be brought about by enzymes. Free fatty acids are accumulated and then synthesized by means of esterase into glycerides. The activity of esterase reaches a maximum when the percentage of oil is increasing rapidly.—(*Courtesy Biol. Abs.*)

Physiological variations in certain crop plants following seed exposure to high-voltage X-rays, C. N. MOORE and C. P. HASKINS (*Bot. Gaz., 94 (1933), No. 4, pp. 801–807, figs. 6*).—Seeds of cotton, tung-oil tree, snapdragon, phlox, and sour orange were exposed dry to the unfiltered radiation from a Coolidge water-cooled tungsten-target X-ray tube operated at 200 kv peak, with 30 ma, at a focal distance of 50 cm. The dosage under these conditions totaled 300 r-units per minute.

Physiological variations and abnormalities were noted, including dwarfing, delayed growth, fasciation, and tissue inversion and replacement. No histological examination was made.—(*Courtesy Biol. Abs.*)

The physiology of cold resistance in winter wheats [trans. title], A. MUDRA (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 18 (1932), No. 3, pp. 435–478, figs. 5*).—Experiments with young wheat plants grown in a greenhouse in which the temperature could be adjusted gradually showed that fall in temperature causes specific responses which are similar in kind but differ in intensity according to the hardiness of the variety, the most important response being an increase in the sugar content of the leaves, especially in nonreducing sugars. A decrease also takes place in the water content of the plant. Both phenomena depend upon an increase in the osmotic value of the cell sap. The adaptation to cold, as shown by the prevention of the formation of a lethal amount of ice, depends upon the fact that the increased osmotic pressure calls forth the formation and stabilization of protoplasmic colloids which are more resistant rather than upon a general increase in concentration. These changes increase with the hardiness of the variety.

GENETICS

Cytological studies in Colocasia (preliminary report) [trans. title], Y. MAYEDA (*Crop Sci. Soc. Japan Proc., 4 (1932), No. 4, pp. 315–318, figs. 3*).—

The haploid chromosome number (pollen mother cells) of *C. antiquorum* was found to be 14, and the diploid number of *C. antiquorum* and *C. gigantea* (root tip cells) was 28. During meiosis in *C. antiquorum*, lagging chromosomes were noted and often pollen with many nuclei is formed, possible causes for the sterility observed in this plant.

Chromosome numbers in flax (Linum), A. C. Dillman (*Science, 78 (1933), No. 2027, p. 409*).—The haploid chromosome numbers, determined by A. E. Longley, were 15 for *L. rigidum*, *L. sulcatum*, Hoshangabad flax, and Bison flax, and 9 for *L. perenne asiaticum*.

Meiotic mitosis in Hordeum sativum [trans. title], C. Inouye (*Crop Sci. Soc. Japan Proc., 4 (1932), No. 4, pp. 304–314, pls. 2; Eng. abs., pp. 311–314*).—The pollen mother cells of 2-rowed and 6-rowed barleys were studied cytologically at Miyazaki Agricultural College.

When the nuclear division begins, the nuclear contents contract and separate from the nuclear membrane to form the synizesis stage. At the end of synizesis the contracted threads begin to expand again in the nuclear cavity and gradually become arranged in the pairs of the zygotene stage. During this stage, however, the pairing threads draw closer together until they seem to have united and enter the pachytene stage. At the late pachytene stage the spireme seems gradually to lose its chromatin, until all the spireme becomes nearly colorless and enters the achromatene stage.

After the achromatene stage chromatin gradually reappears on the achromatic spireme. At about the same time, however, the spireme begins to split into two threads and enters the diplotene stage. It appeared that the achromatene stage is a necessary preliminary to the resolution of the spireme into two threads.

During the first telophase the nucleolus is formed from the chromatin of the chromosomes, which concentrates gradually to form a mass of spherical shape, while the chromosomes losing most of their chromatin become the spireme of the interkinesis. During the second prophase, however, the spireme seems to reform the chromosomes, gradually receiving chromatin from the nucleolus. Again in the second telophase the opposite movement takes place, as the chromatin of the chromosomes apparently concentrates to form the nucleolus.

A dwarf mutation in kafir, J. B. Sieglinger (*Jour. Heredity, 24 (1933), No. 9, pp. 336–338, fig. 1*).—A dwarf mutation, noted in an F_3 progeny row of a cross between Red kafir and (probably) Reed kafir, behaved as a recessive and differed from the normal stature by one factor. The normal kafir in 1931 averaged 51.6 in. in height and the mutant dwarf 20.6 in.

Cytological studies in Malvaceae and certain related families, J. H. Davie (*Jour. Genet., 28 (1933), No. 1, pp. 33–67, pls. 2, figs. 26*).—The results of the essential stages of somatic mitosis and pollen meiosis in certain Malvaceous genera are set forth.

Chromosome numbers (diploid) described as newly recorded included *Malva sylvestris*, *M. sylvestris* vars. *violascens* and *alba*, *M. oxyloba*, *M. rotundifolia*, *Kitaibelia vitifolia*, and *Pavonia spinifex*, all 42; *M. nicaeensis* ca. 64; *Lavatera trimestris*, 14; *L. arborea*, 36; *L. olbia*, 40; and *L. cachemiriana*, (haploid 22); *Althaea ficifolia*, 44; *A. officinalis*, 40–44; *Hibiscus africanus majus*, 56; *Abutilon thompsonii*, 16; *Malope trifida*, 44; and *Theobroma cacao*, 20. Morphologically the chromosomes showed considerable uniformity. All the Malvaceous types examined have or are derived from the basic number 7, while *Theobroma cacao* (*Sterculiaceae*) has the basic number 10. Observations of mitosis and meiosis confirm and extend the theory of secondary association of chromosomes in polyploids. A possible course of the evolution of the genus *Gossypium* is discussed. Spindle formation is described in *Lavatera trimestris*.

Cytology and breeding of Rubus macropetalus, the Logan, and related blackberries, G. M. Darrow and A. E. Longley (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 5, pp. 315–330, figs. 6*).—Based on a study of plants assembled at the Oregon Experiment Station, on wild forms in various regions of the Pacific Northwest, and on the results of cytological studies, the authors conclude that there are at least three important Pacific coast species of *Rubus*, namely, *R. macropetalus*, *R. loganobaccus*, and *R. vitifolius* (*ursinus*). Of these the first species is considered by far the most abundant.

In presenting descriptions of the species it is stated that considerable variation was observed in *R. macropetalus*, notably in respect to thorniness and sex of bloom. Cytological studies of the pollen mother cells showed 42 haploid chromosomes in dioecious forms of *R. macropetalus* and 21 in *R. loganobaccus*, with considerable variation according to the source of the material. The Logan variety had 21 haploid chromosomes, as did also 10 of 11 random selected selfed seedlings of this variety. The eleventh seedling was pentaploid, with approximately 50 percent of aborted pollen. F_1 Logan seedlings resembled their parent and not the red raspberry, supposed by some to be a parent of Logan. The progeny of Logan (21 chromosomes) × Mammoth (21 chromosomes) were practically all self-sterile, and of 8 examined cytologically 6 had 21 chromosomes and 2 35/2. Logan × Young (21 chromosomes) yielded a large proportion of sterile seedlings. An examination of 10 revealed 9 with 21 and 1 with 21/2 chromosomes. Logan × Lucretia (21 chromosomes) yielded mostly sterile seedlings, all of those examined having 21 chromosomes. *R. spectabilis*, *R. parviflorus*, and *R. leucodermis* all had 7 chromosomes. Some supposed seedlings of *R. macropetalus* × Logan were perfect flowered and fertile. The authors conclude that Logan probably originated as a red-fruited, perfect-flowered sport of *R. loganobaccus*.

Pseudogamy in blackberry crosses, G. M. Darrow and G. F. Waldo (*Jour. Heredity*, *24* (*1933*), *No. 8, pp. 313–315*).—Asserting that some European forms of blackberry may produce as high as 100 percent of pseudogamic seedlings, the authors report that in crosses made by the U.S. Department of Agriculture between Oregon Evergreen and Himalaya (European types) used as ovule parents and Taylor, Kittatinny, Early Wonder, Snyder, Lawton, Joy, Austin Thornless, and Eureka (American types) used as pollen parents about one tenth of the resulting Oregon Evergreen and one third of the Himalaya progeny were true seedlings and the balance pseudogamic. The cross Himalaya × Oregon Evergreen yielded very close to one third true crosses. One seedling of Himalaya × Austin Thornless was apparently identical with its pollen parent and suggestive of paternal inheritance. All of the varieties listed except Eureka (7) and Austin Thornless (28) had 14 haploid chromosomes.

The inheritance of fluorescence in hybrids between perennial rye-grass and Wimmera rye-grass, H. C. Trumble and I. F. Phipps (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *6* (*1933*), *No. 3, pp. 170–178*).—Wimmera ryegrass when self-fertilized produced both nonfluorescent and fluorescent seedlings, which when mature proved to be annual plants with variable but typical Wimmera ryegrass characteristics. Annual plants of Wimmera ryegrass, homozygous for nonfluorescence, were isolated. Hawke's Bay perennial ryegrass (*Lolium perenne*) when self-fertilized produced nonfluorescent seedlings, all truly perennial. F_1 hybrids between Wimmera and Hawke's Bay ryegrass were perennial, principally of the short-lived type, and were either fluoresent or nonfluorescent. Fluorescence is dominant in inheritance, depending on one and possibly two genetic factors.

The heterozygosity of Wimmera ryegrass for fluorescence and the nonfluorescent character of the annual rigid ryegrass (*L. rigidum*) indicated that occurrence of fluorescence with annual or short-lived habit in Italian ryegrass (*L. multiflorum*), Wimmera ryegrass, and "false-perennial" ryegrass is merely chance association. Thus when Wimmera ryegrass is growing near or with perennial ryegrass, the ultraviolet light test may give a false estimate of the percentage of true perennial plants.

It was also found that South Australian commercial subterranean clover is nonfluorescent and an early-flowering type from Western Australia is fluorescent.

The inheritance of characters in Setaria italica (Beauv.), the Italian millet, IV–VI (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 552–556, pl. 1; 557, 558, pl. 1; 559, 560*).—The series (E.S.R., 69, p. 784) is continued.

IV. *Spikelet-tipped bristles*, G. N. R. Ayyangar, T. R. Narayanan, and T. N. Rao. An extra spikelet, occasionally borne at the tips of the bristles in *Setaria*, is more common in the cultivated *S. italica* than in wild *S. glauca* or *S. verticillata*, and behaves as a definite heritable character. The condition where most bristles are tipped with a spikelet, termed full, is allelomorphic to the nil spikeletted bristle condition. Full in some families was found to be a simple recessive to nil, while in other families dominance was incomplete, and an intermediate heterozygous class stray with few bristles spikeletted was present, the three groups occurring in a 1:2:1 ratio. The full spikeletted condition was found incompatible with a long bristle. The history of more than 150 families representing both the types of inheritance is detailed.

V. *A type of lax earhead*, G. N. R. Ayyangar and P. S. Sarma.—A primitive type of lax head, characterized by fewer spikes and spikelets and chronic sterility, behaved as a simple recessive (*a*) to the normal economic dense (*A*) earhead.

VI. *Albinism*, G. N. R. Ayyangar and T. R. Narayanan.—A simple monofactorial type of segregation for green (C_1) and albino seedlings in *S. italica* is reported. The absence of C_1 results in albinos which do not survive.

Inheritance of stem-rust reaction and correlation of characters in Pentad, Nodak, and Akrona durum-wheat crosses, G. S. Smith and J. A. Clark (*U.S. Dept. Agr., Tech. Bul. 385 (1933), pp. 28, figs. 2*).—The segregation of and associations among stem-rust reaction, plant yield, test weight, kernel plumpness and weight, dates of heading and ripening, length of fruiting period, gasoline color value, and crude-protein content were studied in cooperation with the North Dakota Experiment Station in three crosses involving Pentad, Nodak, and Akrona durum wheats.

The stem-rust reaction of mature plants in the field was found to be inherited as a quantitative character. The F_2 and F_3 stem-rust data, taken on an individual plant basis, showed that the susceptibility of Akrona was incompletely dominant to the two degrees of resistance of Pentad (strongly resistant) and Nodak (weakly resistant), and that susceptibility could be attributed to two major genetic factors. While the other characters could not be analyzed genetically, they all seemed to be fundamentally hereditary. Correlation studies of F_3 strains showed that stem rust reduced yield, test weight, kernel weight and plumpness, and crude-protein content. The high correlation between yield and kernel plumpness evidently was affected little by variations in rust or in length of fruiting period. The yield, kernel plumpness and weight, and test weight were favored by a long fruiting period in a relation rather independent of fluctuations in stem-rust infection. A shorter fruiting period tended to favor higher gasoline color values.

Genetics of resistance to four physiologic forms of bunt in two winter wheat crosses, A. M. Schlehuber (*Northwest Sci., 7 (1933), No. 2, pp. 43–48, fig. 1*).—The reaction of Albit, Minhardi, and Buffum 17 winter wheats and the F_3 progeny of Albit × Minhardi and Albit × Buffum 17 to four physiologic forms of bunt was studied at the Washington Experiment Station in cooperation with the U.S. Department of Agriculture.

F_3 progeny of both crosses were found completely susceptible when inoculated with forms of Pt-13 and Pt-2 to which both parents are susceptible, but a range from complete immunity to complete susceptibility was observed in F_3 when inoculated with forms Pt-1 and Pl-5 to which one parent is immune and the other susceptible. In the F_3 of Albit × Minhardi, the classes homozygous and heterozygous resistants and heterozygous and homozygous susceptible, respectively, closely approximated a 7:4:4:1 ratio to form Pt-1, indicating a two main factor difference. The high value of r, 0.956±0.008, between Pt-1 and Pl-5 indicated that the same two main factors responsible for resistance to form Pt-1 are also responsible for resistance to Pl-5. Minhardi introduces a factor which prohibits the action of A^1. Neither Albit, Minhardi, nor Buffum 17 seemed to possess genes for resistance to forms Pt-13 and Pt-2. Resistance in the F_3 of Albit × Buffum 17 to Pt-1 and Pl-5 is suggested as due to not more than four multiple factors.

The cytology of certain intergeneric hybrids between Festuca and Lolium, F. H. Peto (*Jour. Genet., 28 (1933), No. 1, pp. 113–156, pl. 1, figs. 62*).—Evidence on the genetical relationship of parents of diploid hybrids between *Lolium* and *Festuca* was determined at the Welsh Plant Breeding Station from calculations of the chiasma frequencies at the heterotypic metaphase in the F_1. A segregation of genetical factors limiting chiasma frequency was observed in the back-crosses. Presence of chains of four chromosomes in the heterotypic metaphase in one diploid hybrid indicated that translocation, reduplication, or interchange had occurred between nonhomologous chromosomes in one parental species. In the diploid-hexaploid cross (*L. perenne* × *F. arundinacea*), a high proportion of the *Lolium* chromosomes paired with their homologues in the *Festuca* complement, and a small amount of autosyndesis occurred among the chromosomes of the latter. Fragmentation occurred in F_1 of *L. perenne* × *F. arundinacea* and in every back-cross to the male parent where the constitution of the parental gametes was reasonably certain. Demonstration of genetical crossing over was afforded by the occurrence of an unusual quadrivalent association in the heterotypic metaphase of one of the hybrid derivatives. Chromosome pairing and chiasma frequency, fragmentation, and morphological and physiological abnormalities are also discussed.

Hybrids between wheat and couch grass, S. Verushkine and A. Shechurdine (*Jour. Heredity, 24 (1933), No. 9, pp. 328–335, figs.* [2]).—The characteristics and behavior of hybrids between wheat—*Triticum vulgare* and *T. durum*—and *Agropyron intermedium* and *A. elongatum* are described in some detail, and the successful crossing of four other species of *Triticum* with *A. elongatum* is reported.

The limits of applicability of correlation technique in human genetics, L. Hogben (*Jour. Genet., 27 (1933), No. 3, pp. 379–406, fig. 1*).—Employing much of the data on theoretical correlations of relatives noted in previous papers (E.S.R., 69, p. 32), the author points out that like environment may influence the correlation between various characteristics and thus all of the observed correlation between relatives should not be attributed to genetic factors.

Correlation between white coat colour, blue eyes, and deafness in cats, R. C. Bamber (Bisbee) (*Jour. Genet., 27 (1933), No. 3, pp. 407–418*).—After citing several references to literature, making clear the close relationship between deafness, blue eyes, and white coat color in cats, further cases having a bearing on this subject are noted. These include (1) a blue-eyed white cat which was not deaf, (2) a white cat having one blue and one greenish yellow eye which was deaf, and (3) an albino pink-eyed cat which was not deaf.

The above cases show exceptions to the belief that blue-eyed white-coated cats are always deaf, and demonstrate that deafness may occur in cats even with the presence of yellow pigment in the eye.

A note on the inheritance of the brindle character in the coloration of Irish wolfhounds, F. F. Darling and P. Gardner (*Jour. Genet., 27 (1933), No. 3, pp. 377, 378*).—Data are recorded on the character of brindle and nonbrindle in Irish wolfhounds. Twenty-seven litters, comprising 155 individuals, were produced by crossing brindles with brindles, of which 82 percent were brindle pups and 18 percent were nonbrindles. When brindles were crossed with nonbrindles, producing 14 litters comprising 84 individuals, there were 67 percent brindle pups and 33 percent nonbrindles. It appears that the brindle parent may arise either as the result of a definite Mendelian dominant factor or that it is the extension of a heterozygous condition of black with red or dun.

A comparison of the chromosomes of the rat and the mouse, W. Bryden (*Jour. Genet., 27 (1933), No. 3, pp. 421-433, figs. 10*).—The 42 chromosomes in the Wistar rat and the 40 in the mouse were found to be similar in form and shape. Peculiarities of chromosome behavior, chiasmata frequencies, and crossing over were similar in both species.

Genetic studies in poultry.—IX, The blue egg, R. C. Punnett (*Jour. Genet., 27 (1933), No. 3, pp. 465-470, pls. 2*).—Continuing studies in this series (E.S.R., 64, p. 821), data are reported on the color of the eggs produced by the F_1s from a mating of a Chilean hen with a Golden-Penciled Hamburg cock.

Based on the results of these matings, it is concluded that the blue egg character behaves as a simple dominant to nonblue. The matings in which both parents were heterozygous for blue egg color produced 22 pullets which laid blue eggs, to 10 which laid nonblue eggs. In matings of birds laying nonblue eggs with those laying heterozygous blue eggs, there were produced 15 pullets which laid blue eggs, to 18 which laid nonblue eggs.

It is pointed out that when blue is combined with the various shades of brown it gives a series of green- and olive-colored eggs. Polychromatism in fowls' and pheasants' eggs appears to follow similar lines.

The relation of age to the frequency of chiasma formation in the Wistar rat, W. Bryden (*Jour. Genet., 27 (1933), No. 3, pp. 415-420, figs. 2*).—The influence of age on chiasma frequency in the rat was studied at the University of Edinburgh. Miotic complexes of the testes of rats at 2, 8, and 17 months of age were examined in the early diplotene and metaphase stages. The results paralleled those of Crew and Koller with mice in that the frequency for chiasmata formation was related to age, being 2.0 in the youngest group, 1.98 in the 8-month-old group, and 1.84 in the 17-month-old group at the diplotene stage. Similar age differences were observed at the metaphase stage in the number of terminal chiasmata per bivalent and the percentage of bivalents showing chiasmata.

Early developmental stages in the albino rat, L. I. Wright (*Kans. Acad. Sci. Trans., 34 (1931), pp. 109-111*).—Observation of ova in the albino rat before and just after fertilization is noted.

The effect of feeding desiccated thyroid upon the sexual maturation of the albino rat, E. Da Costa and A. J. Carlson (*Amer. Jour. Physiol., 104 (1933), No. 1, pp. 247-252*).—The administration of from 0.5 to 1 mg of desiccated thyroid daily to female rats tended to increase slightly the rate of sexual maturity, whereas greater amounts of thyroid, from 5 to 10 mg, definitely increased the number of days to sexual maturity which, for the controls, averaged 75.4 days. The average number of days to sexual maturity was reduced to 71.7 by the feeding of 0.75 mg of the thyroid, and was increased to 93.4 days by feeding as much as 7.5 mg of the thyroid. Similar results were obtained when desiccated thyroid was fed to males to study the influence on body weight and relative weight of the testes.

Multiple ovaries in mice, N. Werthessen and G. Pincus (*Amer. Jour. Physiol., 104 (1933), No. 1, pp. 117–119*).—Groups of female mice in which two ovaries were transplanted on the back or in the kidney were found to show somewhat lengthened oestrous periods following the operation as compared with the length of the oestrous periods before the ovarian transplants were received. Cycles after the first were normal in length.

Hypophysectomy in pregnant rabbits, W. M. Firor (*Amer Jour. Physiol., 104 (1933), No. 1, pp. 204–215, figs. 8*).—Operative technic for an infraorbital approach to the sella in the rabbit is described in some detail. The results of four experiments are presented dealing with the removal of the pituitary in 8 rabbits almost immediately after coitus, in 11 on the third day after coitus, in 11 in midpregnancy, and in 9 at from 4 to 7 days before parturition, plus the necessary controls.

The results indicated that the removal of the pituitary gland prevented ovulation, but where the gland was not removed until 50 minutes after coitus ovulation occurred. Hypophysectomy immediately after coitus caused the corpora lutea to retrogress by the third day. Hypophysectomy at from 50 minutes to 3 hours after coitus caused the ovaries to atrophy, and no pregnancies were noted. Hypophysectomy in midterm caused the death of all the fetuses. The group hypophysectomized just before parturition aborted living young at intervals two days after the operation. Thus, in rabbits it is apparent that the hypophysis is essential for ovulation, the life of the corpus luteum, and the continuation of pregnancy.

The development of the external form of the guinea-pig (Cavia cobaya) between the ages of 21 days and 35 days of gestation, M. T. Harman and M. P. Dobrovolny (*Jour. Morph. and Physiol., 54 (1933), No. 3, pp. 493–519, pls. 2, figs. 5*).—The weights and measurements of guinea pig embryos at successive stages of development from 21 to 35 days, as well as descriptions of the embryos, are reported. Sex differentiation by the external genitalia was possible on the twenty-fourth day, and on the thirty-fifth day the general external appearance approached that of the new-born guinea pig.

The rudimentary copulatory organ of the domestic fowl, E. MacDonald and L. W. Taylor (*Jour. Morph. and Physiol., 54 (1933), No. 3, pp. 429–449, pls. 4*).—An account is given of the development of the rudimentary copulatory organ in 1,400 birds ranging from 4-day embryos to 12-week-old chickens. The organ was first observed in 6-day embryos of both sexes, and it continued to enlarge up to the twelfth day of embryonic life, after which the organ diminished in size in females. It was estimated that sex could be distinguished in chicks at hatching with an accuracy of about 90 percent.

FIELD CROPS

The arrangement of field experiments and the statistical reduction of the results, R. A. Fisher and J. Wishart (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 10 (1930), pp. 24*).—Plat arrangements by the methods of randomized blocks and the Latin square are described, with remarks on arithmetical processes involved in the interpretation of results, the structure of an experiment in relation to the analysis of variance, and illustrative examples. Earlier publications of the Rothamsted Experimental Station on applied statistics are listed.

[Field crops experiments in Alaska, 1932], G. W. GASSER and B. B. BURROUGHS (*Alaska Col. Sta. Bul. 2 (1932), pp. 5–7, 9, 10–21, 23–25, 28–33, 36, 37, figs. 4*).—Continued progress is reported from agronomic experiments (E.S.R., 68, p. 182) carried on at the station and Matanuska Substation, including variety trials with potatoes, alfalfa, perennial vetch and other forage plants, and lawn and pasture grasses; variety-fertilizer tests with red clover, Russian clover, Siberian clover, sweetclover, and other clovers; a fertilizer test with bromegrass; breeding work with wheat; a tuber-index study with Irish Cobbler potatoes; germination studies with wheat, oats, and barley; crop rotations; and production operations and costs involved in growing vetch, field peas, oats, oats and vetch, and potatoes.

[Field crops studies, 1920–32, on Indiana Station experiment fields and farms], A. T. WIANCKO ET AL. (*Indiana Sta., Expt. Farms Rpts., Herbert Davis Forestry Farm, 1923–32, p. 4; Huntington Field, 1919–28, p. 4, and 1919–32, p. 4; Jennings Co Field, 1921–32, pp. 8–10; Pinney-Purdue Field, 1920–32, p. 6; Purdue-Vincennes Farm, 1925–32, pp. 6–8; Sand Field, 1924–32, pp. 5, 6, 8*).—These reports deal with variety tests of wheat, rye, soybeans, oats, barley, and corn; a comparison of clover and timothy; crop rotation trials; pasture fertilization; and variety and stage of cutting tests with alfalfa.

[Field crops studies, Soils and Crops Experiment Farm, 1920–32], A. T. WIANCKO and R. R. MULVEY (*Indiana Sta., Soils and Crops Expt. Farm Rpt., 1915–32, pp. 14–20, fig. 1*).—Progress reports are presented on the relative winter hardiness of red clover from different regions, the method and rate of seeding soybeans for hay and seed, and variety tests of wheat, barley, oats, and rye.

[Farm crops research in Pennsylvania] (*Pennsylvania Sta. Bul. 293 (1933), pp. 5, 19, 20, 24, 28, fig. 1*).—Agronomic experimentation reviewed briefly embraced variety trials with alfalfa and turf grasses by H. B. Musser, and with soybeans for hay and seed by C. J. Irvin; breeding work with wheat and oats; improvement studies and fertilizer tests with cigar filler tobacco by O. Olsen; effects of fertilizers on lawn grass and weeds by C. O. Cromer; and fertilizer tests on pasture. Several investigations were in cooperation with the U.S. Department of Agriculture.

Philippine bibliography of the nine major crops of the Philippines: Rice, sugar cane, abaca, coconut, tobacco, corn, maguey, coffee, and cacao, compiled by B. HERNANDEZ (*Manila: Bur. Sci. Libr., 1933, pp. II+132*).—This bibliography lists 236 references on rice, 346 on sugarcane, 114 on abaca, 157 on coconuts, 104 on tobacco, 78 on corn, 24 on maguey, 42 on coffee, 35 on cacao, and 19 on the general agriculture of the Philippine Islands. Indexes are included for each crop.

Solid and hollow stemmed grasses of the Jornada Experimental Range, R. H. CANFIELD (*Science, 78 (1933), No. 2024, p. 342*).—The 70 species of grasses examined on the Jornada Plains of southern New Mexico comprised 52 species with solid stems, which includes 7 of the 15 annuals and 45 of the 55 perennials. The species pertaining to *Bouteloua*, *Sporobolus*, *Aristida*, *Hilaria*, and *Scleropogon*, which furnish 85 percent or more of the forage in the region derived from grasses, are characterized by solid stems, and can endure grazing to a marked degree during prolonged drought.

Assimilation of fixed nitrogen by grasses and clovers, A. B. BEAUMONT, W. S. EISENMENGER, and W. J. MOORE, JR. (*Jour. Agr. Res. [U.S.], 47 (1933), No. 7, pp. 495–503, figs. 2*).—Timothy, redtop, Kentucky bluegrass, orchard grass, and English ryegrass, and red, alsike, and white clovers were grown at the Massachusetts Experiment Station in nutrient solutions containing sodium nitrate, ammonium sulfate, and urea, respectively.

In early growth stages the nitrogen of ammonium sulfate appeared to have been assimilated most rapidly and best by grasses, but in the experiment as a whole, nitrate nitrogen evidently was most readily and completely assimilated by the grasses, and urea by the clovers, as determined by appearance, dry matter produced, and chemical composition. In later growth stages the plants grown in unsterilized ammonium sulfate solutions and in urea solution developed grayish brown to black and more or less decayed roots, but not in similar sterilized solutions. The root trouble developed seemed due to the accumulation in the roots of unassimilated ammonia or other intermediate form of nitrogen, which narrowed the carbon-nitrogen ratio and made the root tissue susceptible to the attack of decay organisms.

The order of assimilability of nitrogen by the grasses was sodium nitrate, urea, and ammonium sulfate, and by the clovers, urea, sodium nitrate, and ammonium sulfate. Addition of calcium carbonate to the ammonium sulfate solution for the purpose of buffering it against physiological change in reaction did not change the order.

Resistance of varieties of winter wheat and rye to low temperature in relation to winter hardiness and adaptation, S. C. SALMON (*Kansas Sta. Tech. Bul. 35 (1933), pp. 66, figs. 5*).—The injury, and in some cases the survival, was recorded for more than 125,000 plants of winter varieties of wheat, rye, oats, and barley artificially frozen in about thirty thousand 4-in. greenhouse pots or flats during five years. Data from these experiments were correlated with the average survival from winterhardiness nurseries of the U.S. Department of Agriculture, so far as possible, and the relations between resistance to cold and varietal adaptation are discussed. The technic of artificial freezing and certain precautions to be observed are indicated.

Because a secondary effect, probably physiological, appearing in many experiments soon after freezing made it impossible to use the survival of the plants as a criterion of injury, the relative injury was estimated and recorded in percentages. Comparison of the percentage of plants killed for those experiments in which this secondary effect did not appear and of estimated injury based on appearance of plants a few days after freezing, indicated that the latter may be safely used in most cases. It appeared essential in artificial freezing tests that all plants to be compared be frozen at about the same time of day.

The moisture content of the soil was found to affect materially the degree of injury. The lesser injury usual on a wet soil appeared largely due to a lag in temperature. The size of the clump of plants taken from the field for freezing materially influenced results. Disturbing the roots as in transplanting had very little effect on the injury or survival of plants. Results of determining relative resistance to cold by growing plants in pots (or flats) and exposing them to natural freezing out-of-doors during the winter correlated very well with artificial freezing, indicating that this method may be useful when refrigeration equipment is not available.

Correlations obtained between results of artificial freezing of thoroughly hardened varieties of wheat and survival under field conditions were high. It appeared that a single artificial freezing test under conditions specified may be expected to furnish a more reliable prediction of relative winterhardiness in the

Great Plains than would the survival of a single winterhardiness nursery selected at random, but less reliable than the average of all winterhardiness nurseries for a single season. The injury by artificial freezing of regional varieties of winter wheat, other than those in the winterhardiness nurseries, was in agreement with their relative known hardiness under field conditions in the Great Plains. Such injury to winter wheat and also the resistance to low temperature of winter barley, winter oats, and varieties of winter rye were also in accordance with the view that resistance to cold is a predominating factor in determining adaptation and distribution.

The group of varieties classified by Quisenberry and Clark (E.S.R., 64, p. 436) as very hardy and medium hardy often were not hardier than normally tender varieties if frozen without previous exposure to low temperatures, verifying observations by Hill and Salmon (E.S.R., 58, p. 737). For these varieties exposure to low temperatures for some time before freezing appeared essential for a true expression of their relative hardiness. Growing the plants at high temperatures (22° to 25° C.) reduced the difference between varieties in cold resistance, but excepting varieties of very hardy and medium hardy groups, the relative resistance tended to remain the same. Hardened plants of several wheat varieties exposed to greenhouse temperatures suffered a loss in hardiness in from 12 to 24 hours at about the same rate, and most of the differences in hardiness disappeared in about 120 hours. Artificial refrigeration was used, apparently with success, to eliminate nonhardy varieties in mixtures and nonhardy segregates in hybrid populations of a number of crosses.

No evidence of a differential response to hardening was found in winter rye, relative resistance to low temperature appearing to be the same, except for the degree of differences, regardless of the temperature at which the plants were grown.

Pasture investigations, II, III (*[Connecticut] Storrs Sta. Buls. 186 (1933), pp. 14; 187 (1933), pp. 54, figs. 9*).—These bulletins continue previous work (E.S.R., 61, p. 430).

II. *Penetration of surface applied lime and phosphates in the soil of permanent pastures*, B. A. Brown and R. I. Munsell.—The penetration of limestone and superphosphate (16 percent) applied on the surface of permanent pastures was measured in three experiments by determining the pH, Jones lime requirement, and the available phosphorus (Truog's method) of the upper layers of soil. In one study the effects of other phosphorus carriers, and in another the effects of time and rate of application of limestone and superphosphate, were considered.

Even after six years, most of the increases in available phosphorus from surface-applied superphosphate were confined to the upper 2 in. of soil. For at least two years, practically all of the phosphorus was retained in the surface inch. Limestone at 1 ton per acre, applied at about the same time as the superphosphate, decreased the latter's availability, and during the first year reduced production below that of pastures receiving superphosphate only. The availability of phosphorus from superphosphate decreased with increasing quantities of limestone, even where the superphosphate was applied four years before the limestone. In the upper inch of soil, more available phosphorus was found when the superphosphate was applied several months before the limestone, but penetration was slightly greater where the order of applications was reversed. Indications were that lime should be applied several months before superphosphate, and that, except on extremely acid soils, the initial application of limestone should not exceed 1 ton per acre.

The available phosphorus content of the soil was not affected by the inclusion of ammonium sulfate and sodium nitrate in the treatment. Plats receiving phosphatic fertilizers least soluble in water before application had the highest amounts of available phosphorus. Thus where bone meal or raw rock phosphate was used, little relation existed between the amounts of available phosphorus and the growth of crops.

In reducing acidity, most effects of limestone applied to the surface at 1 ton per acre in 1924 and again in 1929 were in 1930 confined to the upper 2 in. of soil. Acidity of the fifth inch of soil was affected appreciably only when 8 and 16 tons of limestone were applied. It seemed impracticable to change appreciably the acidity of the soil below the upper 2 or 3 in. by surface applications of limestone.

III. *Effect of fertilizers on the botanical and chemical composition of the vegetation in permanent pastures*, B. A. Brown.—Changes caused by fertilizers in the botanical and chemical composition of vegetation in permanent pastures were determined in 1929, 1930, and 1931 by estimating the proportions of the total area occupied and of the feed furnished by each species, and by chemical analyses of the vegetation in each of nine 4-acre pastures fertilized differently since 1924. Results in 1929 and 1930 were noted earlier (E.S.R., 67, p. 236).

Marked changes in the botanical composition of the vegetation were caused by certain fertilizer treatments without re-seeding or tillage. Limestone, potash, or nitrogen carriers alone were not effective in altering the character of the herbage, but where superphosphate was applied white clover and Kentucky bluegrass increased greatly and poverty grass was almost eliminated, especially on pastures receiving limestone in addition to superphosphate. With superphosphate, nitrogen was even more effective than limestone in increasing bluegrass, whereas it greatly depressed white clover. Rhode Island bent and sweet vernal grasses were affected less than other species by fertilizer. Weeds were very prevalent on the nonphosphated plats, and occupied the least area on pastures receiving mineral plus nitrogen. Bush cutting (E.S.R., 64, p. 34) became a negligible item two years after application of effective fertilizers.

Analyses of numerous samples of representative pasturage and of pure species showed that distinct changes in the chemical composition of herbage were caused by fertilization. Many changes were due directly to botanical differences which resulted from addition of one or more plant nutrients. The percentages of dry matter, fiber, and nitrogen-free extract were highest in herbage from nonphosphated plats, and lowest where plats received superphosphate with either lime or nitrogen, while the reverse held with ash, nitrogen, fat, and potash. Small differences occurred in the phosphorus content of the phosphated herbage, although feed from nonphosphated plats contained only about 60 percent as much phosphorus. Calcium was depressed by addition of nitrogen and by omission of superphosphate and increased by superphosphate, and especially by superphosphate and lime, due largely to prevalence of white clover. The potassium content of the herbage apparently was increased significantly by either potassic or nitrogenous fertilizers. The calcium: phosphorus ratios varied widely, being largest in the nonphosphated pasturage and smallest where complete fertilizer without lime was applied. High ratios noted under phosphorus-lime fertilization were due to a very high calcium content, whereas in no-phosphorus plats they were caused by low phosphorus percentages. Silicon usually was highest in unfertilized pasturage, but significant differences were not noted in the contents of iron and aluminum. Excepting the nitrogen plats where compared with complete mineral pastures all elements but sulfur decreased. Phosphorus magnesium, sulfur, and chlorine varied with calcium.

Herbage from limed plats consistently contained only about half as much manganese.

Wide seasonal variations occurred in all constituents in the pasturage regardless of fertilization. While weather conditions, particularly dry or cold periods, were especially important factors, the periodic functions of various species and fertilization markedly influenced seasonal changes in composition. When moisture was very deficient, dry matter, ash, nitrogen-free extract fiber, and calcium rose, while nitrogen, fat, phosphorus, and potassium decreased. The dry matter, nitrogen, nitrogen-free extract, and fat contents were highest in the first samples of the season, while the most fiber occurred in June, and the most phosphorus and calcium in July or early August. The least ash, fiber, and calcium was found at the earliest sampling date, while low values for dry matter, nitrogen, nitrogen-free extract, fat, phosphorus, and potassium varied somewhat, although tending to reach their minimum either in early June or late in the season. The calcium : phosphorus ratios were usually largest in July and lowest in early May. Variations in seasonal nitrogen content were reduced by applying part of the nitrogenous fertilizers in early July. More uniform nitrogen contents were found in the mineral than in the mineral-plus-nitrogen pasturage. The chemical analyses showed that the quality of herbage from permanent pastures is poorest during the period of maximum growth, about June 1 in this region, at which time the moisture content and the relative amount of herbage is greatest.

Pasture plants and pasture mixtures suggested for seeding on the acreage taken out of cotton, tobacco, wheat, and corn (*U.S. Dept. Agr., Bur. Plant Indus., 1933, pp. 6, fig. 1; also in Seed World, 34 (1933), No. 11, pp. 5–7, fig. 1*).—Pasture plants, mixtures, and practices are indicated for different soil conditions in different parts of the eastern half of the United States on land taken out of cultivated crops in connection with acreage control contracts covering surplus agricultural products, an activity of the Agricultural Adjustment Administration.

Methods of pasture analysis (*Agr. Prog. [Agr. Ed. Assoc., London], 10 (1933), pp. 223–252, figs. 5*).—Methods of pasture analysis employed successfully in Great Britain and elsewhere are outlined, with a brief history of pasture analysis by W. Davies. The specific frequency method is described by R. G. Heddle, the percentage frequency method by D. H. Robinson, the percentage area method and the point quadrat method by E. W. Fenton, the percentage tiller estimation method by Davies, the transect method by F. R. Horne, the percentage productivity method by R. A. Roberts, and the estimated productivity method by M. Jones and J. O. Thomas.

Varieties of alfalfa in Pennsylvania, H. B. Musser and C. J. Irvin (*Pennsylvania Sta. Bul. 295 (1933), pp. 8, fig. 1*).—Comparative trials of varieties and strains of alfalfa from numerous sources, made from 1919 to 1932 and including series of seedings made in 1918, 1924, 1927, and 1929, showed that hardy variegated alfalfa consistently outyielded the average of common alfalfa, although the best of the common alfalfas were about as good as the hardy variegated sorts. Canada Variegated, Grimm, Ladak, and Cossack yielded best among the hardy variegated varieties, while the Utah, Dakota, and Kansas strains were the most consistently satisfactory of the common alfalfas. The source of the seed to be sown in Pennsylvania should be given careful attention.

Effect of stand irregularities upon the acre yield and plant variability of corn, T. A. Kiesselbach and R. M. Weihing (*Jour. Agr. Res. [U.S.], 47 (1933), No. 6, pp. 399–416, figs. 2*).—Systematically and also randomly variable stands of corn, ranging up to slightly greater irregularity than is obtained from planting seed with 50 percent germination at twice the normal rate, and grown in comparison with uniform stands at the Nebraska Experiment Station, were analyzed statistically as to variability of plant development. Although the variability of a number of plant characters tended to increase somewhat with irregularity of stand, the differences were not of great agronomic importance. The performance of plants within the various hill types occurring in such uneven stands, i.e., 1-, 2-, 3-, 4-, 5-, and 6-plant hills, tended to vary inversely as the number of plants per hill. The natural adjustments in individual plant development accompanying the stand irregularities resulted in similar acre yields of grain.

Some factors influencing the variability in length of cotton fibers on individual plants as shown by the sorter method, G. M. Armstrong and C. C. Bennett (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 7, pp. 447–466, figs. 8*).—Fibers from all bolls on individual plants of a strain of Superseven cotton were arrayed at the South Carolina Experiment Station by Baer and Johannsen sorters which permit an accurate separation of the different lengths into groups by weight. A difference of $\frac{6}{16}$ in. in the practical staple length of the cotton classer was found between fibers of two bolls located rather close together on a plant, and very appreciable differences in the uniformity of distribution of the fibers of various lengths were also shown. A difference of $\frac{3}{16}$ in. in length was found between the lint from seed of one locule and also between the lint from bolls developing from blooms of the same day. Blooms of two successive days differed in length of lint by $\frac{5}{16}$ in. Conditions seemed to favor the production of long lint in bolls from all flowers during certain periods, although during certain short intervals conditions seemed very unfavorable, as relatively short lint was produced. The position of the boll along the vertical axis or the horizontal axis does not seem of great importance in determining lint length, although shorter lint tended to be produced near the top of the plant when grown in the field.

Periodical measurements on characters in developing bolls showed that the surface area of the seed increased most rapidly from about 10 to 18 days of age. The relative increase in seed volume and boll volume was about the same after 10 days, when the boll cavity becomes filled with developing seed and lint. The halo had practically attained full length in 25 days, although not absolutely so in 30 days. No evidence of an increase in the number of fibers per seed after 25 days was obtained. The unit fiber weight was not constant, the shorter fibers showing the greatest weight per inch. Sorter distributions of fibers from bolls at approximately 4-day intervals from 25 to 50 days of age indicated that many fibers continue to elongate after the boll is 25 days old.

Effect of soil fertility, boll-maturation period, and early or late production of bolls on the length of cotton fibers, G. M. Armstrong and C. C. Bennett (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 7, pp. 467–474, figs. 4*).—Small cotton plants, growing on plats of low fertility at the South Carolina Experiment Station and suffering from malnutrition, produced lint practically as long as that produced by vigorous plants growing on highly fertile plats, although the distribution of the different lengths was less uniform in the poorly nourished plants. Lint from bolls produced from blooms that were among the last retained, i.e., those of August 21, was from $\frac{1}{16}$ to $\frac{3}{16}$ in. shorter than that from bolls arising on August 14 and 15. The bolls from blooms opening on the same day, but with a maturation period of 75.1 days, had a larger percentage of short fibers than those maturing in 58 days, although the practical lint length was the same. Variability in lint length and distribution of different length groups was about the same in bolls of a first crop and of a second crop produced on the same plants.

Symptoms of manurial deficiencies in hops, F. H. Beard (*East Malling [Kent] Res. Sta. Ann. Rpt., 20 (1932), pp. 156–158, pl. 1*).—Descriptions are given of foliage characters associated with the omission of nitrogen, potassium, phosphorus, calcium, and magnesium from the nutrient solutions in a sand culture experiment, and it is shown that similar symptoms may occur in the hop garden. Growers are advised to watch for the appearance of any indication of deficiency in the soil and to modify their fertilization accordingly.

The identification of potato varieties by chemical methods, A. M. Smith and I. M. Robertson (*Agr. Prog. [Agr. Ed. Assoc., London], 10 (1933), pp. 168–171*).—Characteristics and limitations of the paracresol-tyrosinase reaction test (E.S.R., 65, p. 529) are indicated, with comments on the merits of other tests. These included the separation of Arran Chief and Great Scot by means of phenosafranine and the obtaining of colors in the tuber, which contains small quantities of amino and phenolic compounds, by diazotization and coupling.

The influence of magnesium on different potato soil types, B. E. Brown, G. V. C. Houghland, O. Smith, and R. L. Carolus (*Amer. Potato Jour., 10 (1933), No. 4, pp. 55–65, fig. 1*).—Well-defined growth disturbances of potato plants observed during several years in a number of important producing sections were characterized chiefly by a chlorotic condition of the foliage, with the lowest leaves affected most seriously. The trouble seemed due to a deficiency of available magnesium in the soil resulting from excessive rainfall on soils low in organic matter or on very acid soil, particularly light soils, whether or not the soil is well supplied with organic matter. Maximum injury occurred where potatoes were planted on highly acid soils with acid-forming fertilizers, particularly those containing a high proportion of ammonium nitrogen. Field experiments showed that addition of a magnesium carrier restores conditions so the plants can function normally.

Efficiency factors in the cultivation of potatoes, E. V. Hardenburg (*Amer. Potato Jour., 10 (1933), No. 5, pp. 94–98*).—Recent experiments by several eastern experiment stations indicated that it usually is most profitable to cultivate potatoes only enough to control weeds efficiently. Using the weeder often early in the season will eliminate many of the more expensive weed control operations later on. Labor for weed control alone on 1,120 farms in western New York in 1929 comprised about 11 percent of the total cost of growing the crop. Comparisons of yields from ridge and level culture generally favored the latter. Survey of practices on 258 New York farms indicated that sunburn injury is somewhat reduced by ridging.

Further studies of the origin of russeting in the potato, C. F. Clark (*Amer. Potato Jour., 10 (1933), No. 5, pp. 88–91*).—Results obtained in more extensive studies (E.S.R., 65, p. 827) involving the removal of the eyes of the Russet Burbank potato revealed no indication of its origin by mutation, although the possible origin as a dichlamyde mutant was not entirely precluded. Breeding tests in which factors for russet skin were transmitted through the germ cells suggested that this potato may be of seedling origin. In the material studied, the russet skin appeared to result from the action of complementary factors. In one seedling (No. 44537) the russet skin character appeared to be due to a mutation.

Causes and prevention of potato tuber defects at harvest time, E. V. Hardenburg (*Amer. Potato Jour., 10 (1933), No. 9, pp. 173–176*).—A field survey in New York at harvest on 101 farms in 1931 and on 137 in 1932 showed that on the average over 20 percent of potato tubers as dug have either mechanical injury or physiological defects. About 9 percent are bruised, while 4.8 percent additional are skinned and cut by the digger. The data made it evident that a crop harvested before complete maturity should be handled more carefully than one normally matured, since it is much more subject to bruising and skinning.

Most of the 13 types of machine diggers in operation on 161 farms in 15 New York counties in 1932 were of the chain elevator type, and all appeared capable of efficient work if operated and equipped properly. Wherever the digger caused much injury, the fault could have been largely remedied. Most bruising was due to too harsh contact of the tubers with the elevator chain rods, especially where the soil was dry and only a little was carried over the elevator. Diggers rigged with a continuous chain usually caused less injury than those carrying rear attachments. Other adjustments were indicated. Comparison on 247 farms showed more tuber injury caused by picking directly into bushel slatted crates than into split or wire stave baskets or tin buckets. With crates, the tendency is to throw the tubers farther than where baskets or buckets are used. Additional handling required in pouring the baskets into crates or buckets did not add materially to the total injury found.

Variety tests of sugarcanes in Louisiana during the crop year 1931–32, G. Arceneaux, I. E. Stokes, R. B. Bisland, and C. C. Krumbhaar (*U.S. Dept. Agr. Circ. 298 (1933), pp. 32*).—Continued plantation tests, comparing promising varieties of sugarcane during the crop year 1931–32, confirmed previous tests (E.S.R., 68, p. 188), demonstrating the comparative inferiority of P.O.J. 213, P.O.J. 234, and P.O.J. 36-M to the more recently introduced C.P. 807 and Co. 281, and to Co. 290 as to vigor and general desirability. Extensive substitution of C.P. 807 and Co. 281 for the P.O.J. varieties under appropriate soil conditions seemed to be warranted.

C.P. 807 consistently outyielded the heretofore favorite P.O.J. varieties by approximately 10 or more tons of cane per acre, and its indicated yields of sugar per ton of cane compared favorably with those from P.O.J. 36-M and P.O.J. 213. C.P. 807 proved suitable for culture on various types of soil in Louisiana, appearing especially well adapted for Sharkey clay and related types of poorly drained soils long utilized for growing cane. Co. 281 consistently gave lower yields of cane per acre but higher indicated sugar per ton of cane than C.P. 807. Co. 281 has given best results in tests east of the Atchafalaya River, although very good results were had west of the river in Iberia Parish on Iberia silt loam. Co. 281, like D-74, does not show the rapid deterioration characteristic of the P.O.J. varieties when windrowed. Co. 290, the only variety so far tested that has exceeded C.P. 807 in yields of cane and sugar per acre, is like Co. 281 subject to attack by the mosaic disease, and the possibility of a serious cumulative effect of this disease should be considered.

P.O.J. 234, the only variety so far available for commercial culture that has consistently afforded cane of satisfactory quality for milling very early in the season, possesses no other important desirable qualities. P.O.J. 213, P.O.J. 36-M and P.O.J. 36, in view of their inferior qualities compared with C.P. 807 and Co. 281, could no longer be regarded as canes of major commercial importance in Louisiana, and P.O.J. 2725, C.P. 71-B, C.P. 177, and C.P. 766 consistently proved inferior to varieties currently available for commercial cultivation. C.P. 28/11 and C.P. 28/19, seedlings recently bred at the U.S. Sugar Plant Field Station at Canal Point, Fla., showed considerable promise. Other qualities and faults of the varieties studied are pointed out.

The physiological effect of low temperature on the biennial growth habit of sweet clover (Melilotus alba), I. J. Johnson (*Sci. Agr., 13 (1933), No. 12, pp. 746–748, fig. 1*).—In an attempt at the Minnesota Experiment Station to induce flowering during the first year of vegetative growth, germinating seeds of Alpha 3 sweetclover subjected to enforced dormancy for 10 and 20 days at 0° C., and for 10 and 20 days at 0° followed by 16 hours at —3°, failed to produce plants blooming during the first year of growth in the field. Seedlings subjected to enforced dormancy at the 3-leaf stage produced plants which flowered during the first year in the nursery. Plants from seedlings held at 0° for 20 and 30 days were superior to those from seedlings kept for 10 days at 0°, suggesting that a 20-day seedling dormancy period is near the optimum needed to induce flowering the first year. Plants from seedlings subjected to enforced dormancy when 3 in. tall gave the same general type of response as those treated earlier.

Sweet clover in Illinois, O. H. SEARS, J. J. PIEPER, and W. L. BURLISON (*Illinois Sta. Bul. 394 (1933), pp. 209-262, figs. 19*).—The characteristics of the sweetclover plant and its species, its climatic and soil requirements, cultural and harvesting practices, the handling of the crop for hay, seed, pasture, and green manure, its soil improvement value, and insects and diseases attacking the crop are described largely from the results of experiments (E.S.R., 66, p. 223) carried on from 1917 to 1932. Sweetclover leads the legumes in acreage in Illinois, increasing from 48,000 acres in 1919 to 850,000 acres in 1932.

Sweetclover thrives under a wide range of climatic and soil conditions, and when properly inoculated will grow in practically any nonacid soil in Illinois. Manure has been a valuable aid in securing a stand, particularly on recently limed land. It was observed that phosphorus as well as potassium can be used profitably on many soils before sweetclover seed is planted. The effectiveness of sweetclover for green manure is also often improved by the use of fertilizers containing potassium.

Most of the sweetclover grown is sown at the time of seeding spring grain, usually the latter part of February and the first part of March in southern Illinois, and the latter part of March and the first of April in northern Illinois, although unhulled seed may be sown in wheat as early as December. The sowing of sweetclover in corn at the last cultivation is often unsuccessful, since seasonal conditions may materially affect the results obtained. Barley probably is the best nurse crop for sweetclover, and early oats and spring wheat are also very good.

The crop ordinarily should be plowed under when green, unless needed for pasture. It may be plowed in the spring of the second season's growth when from 4 to 6 in. high. Postponing plowing during the second season or plowing in the fall of the first year may have certain disadvantages.

Sweetclover may be pastured lightly in the fall, but heavy pasturing of the first year's growth results in considerable winter-killing. Close pasturing during the second year gives satisfactory results. The crop may be pastured after it is 8 in. high. Good yields of excellent hay often are secured in the fall of the first year's growth. The harvesting of sweetclover for hay during the second year of its growth is often unsatisfactory. Such hay is coarse and stemmy, and if moldy occasionally has been known to poison livestock.

Sweetclover in Great Plains farming, M. A. CROSBY (*U.S. Dept. Agr., Tech. Bul. 380 (1933), pp. 54, figs. 5*).—Information on the most effective practices in the production and utilization of sweetclover and its position in the farm organization of the Great Plains area, based on studies of the methods of growers in the several States, treats of production requirements, seeding methods and practices, cost and quantity of seed used and labor and power requirements in seeding under different methods, the amount of pasture provided by sweetclover, hay-making practices and yields of hay, harvesting practices and yields of seed, effect of sweetclover on crop yields, and the place the crop occupies in the cropping systems of different sections. Bloat trouble from pasturing the crop and the so-called "sweetclover disease" or "sweetclover poisoning" from feeding sweetclover hay are also discussed.

The effect of winter exposure in the stook on quality of wheat, R. K. Larmour, J. G. Malloch, and W. F. Geddes (*Canad. Jour. Res., 9 (1933), No. 3, pp. 252–260, figs. 3*).—A number of wheat samples exposed over winter in the shock and threshed in the spring in two seasons were compared with fall-threshed controls from the same lots. While the exposed samples lost grade in 50 percent of the cases and usually decreased in weight per bushel, the flour yield generally was increased slightly. In baking quality 22 percent showed improvement and 40 percent showed damage. Changes in grade and bushel weight did not correspond closely with changes in baking behavior.

Wheat production in Colorado, 1926–1932, D. W. Robertson, A. Kezer, J. F. Brandon, J. J. Curtis, D. Koonce, and W. W. Austin (*Colorado Sta. Bul. 404 (1933), pp. 44, figs. 7*).—Komar and Dicklow (for conditions resembling those at Fort Lewis) spring wheat and Kanred winter wheat are recommended for planting in Colorado from the result of extensive variety trials (E.S.R., 60, p. 40), continued from 1926 to 1932 at the station and Fort Lewis, both under irrigation, and in cooperation with the U.S. Department of Agriculture at Akron on dry land. Milling and baking tests showed Komar to be as good a bread wheat as Marquis. Blackhull seemed to have a type of protein which could not endure manipulation in a high-speed mechanical mixer. Soil preparation, seed treatment, seeding, irrigation, and harvesting practices are also indicated, with remarks on producing areas.

Dormancy in small-grain seeds, G. W. Deming and D. W. Robertson (*Colorado Sta. Tech. Bul. 5 (1933), pp. 12*).—In germination studies on varieties of wheat, barley, and oats, harvested when ripe enough to be cut with the binder (some seeds hard but the bulk in the hard-dough stage), the percentage of seeds germinating in 10 days after planting in moist sand served as a gage of a dormant period after harvest.

Marquis wheat exhibited considerable dormancy for the first 10 days, while Kanred, Kubanka, and Federation showed a high germination when planted immediately after harvest. Black Winter emmer, Bearded Winter spelt, and einkorn showed a slight dormancy, but less than Marquis. Behavior of an F_1 hybrid of Marquis × Federation indicated that dormancy might be inherited as a dormant character.

Among 6-rowed barleys, Colsess, Trebi, Lion, and Arlington Awnless had dormant periods of about 20 days after harvest, whereas Manchuria and the naked Nepal and Himalaya had a high germination immediately after harvest. Of the 2-rowed barleys, Hanna, White Smyrna, and *Hordeum deficiens nudideficiens* showed slight dormancy up to 7 days after harvest, while Canadian Thorpe and *H. distichon nigrinudum* showed a high percentage of germination when planted just after harvest. Colorado 37 and Nebraska 21 oats germinated immediately after harvest and also had been observed to sprout badly in the shock under unfavorable weather conditions. Kanota, however, had a long dormancy period after harvest and resisted sprouting in the shock.

A study of shoot formation by Canada thistle [trans. title], A. Åslander (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 429 (1933), pp. 37, figs. 14; Eng. abs., pp. 36, 37*).—Continued investigations aimed at the control of Canada thistle (E.S.R., 60, p. 41) dealt with various aspects of shoot formation.

Most conspicuous in the root system of Canada thistle are the propagation roots, which grow horizontally in the soil from 15 to 30 cm deep. These roots are usually biennial, forming in one year and producing vegetative and flowering shoots during the second year, after which they usually decay. In the second year, however, they form a new set of propagation roots so that a colony is maintained which generally enlarges every year. The numerous buds formed on the propagation roots were described as shoot buds which normally form shoots, adventive buds which sprout quickly on severed root pieces, adventive buds with delayed sprouting, and new buds which form at the base of the branch root or from within the stele. New buds of the second type sprouted only on root pieces kept in a germination bed for 3 to 4 months. New buds did not form from wound callus, and all buds appeared endogenous. Many adventive buds were found on the propagation roots, since the cutting of a root into pieces 1 cm long resulted in shoot formation on most pieces.

Root pieces of various lengths planted in pots sprouted at almost any soil moisture content. Pieces 5 cm long could force a shoot through a soil layer 15 cm thick. When roots were planted and the shoots harvested as they appeared above the soil surface, only about 30 percent of the soluble carbohydrates disappearing from the shoot-forming roots could be recovered in the shoots, whereas nitrogenous substances were transformed without loss. Injury to a root caused an increase in the production of carbon dioxide and the quantity of water-soluble nitrogenous substances and monosaccharides, but lowered the pH of the wound tissue. When these changes occurred, shoot formation began.

A practical conclusion from the investigation is that the control of Canada thistle should aim at stimulation of profuse shoot formation in order to exhaust the supply of reserve food in the roots. Deep cultivation (ridge fallow), which cuts the propagation roots, is recommended.

Russian thistle, H. O. Powell (*Regina, Sask.: Dominion Agr. Credit Co., Ltd., 1933, pp. 19*).—The control and utilization of Russian thistle is discussed from the practical experiences of Canadian farmers and research of experiment stations in Canada and United States.

The effect of some chemicals on germination in cocksfoot (Dactylis glomerata L.), H. G. Chippindale (*Ann. Appl. Biol., 20 (1933), No. 3, pp. 369–376*).—Although efforts to hasten germination of orchard grass seed by treatment with solutions of several salts were not successful, a pronounced acceleration could be produced by soaking the seed in water and drying for some time before planting.

Vitality of weed seeds kept in ordinary manure and in Krantz-method manure [trans. title], W. Trzciński (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest Ann.), 30 (1933), No. 2, pp. 213–232; Eng. abs., p. 232*).—Stable manure handled according to the Krantz method was piled in loose heaps, attaining a temperature of 65° C. (149° F.) within 3 days, and then was compressed by tramping or otherwise. The temperature of ordinary manure kept firm from the beginning did not exceed 40°. Seeds of 10 weed species were placed in manure in shallow wooden boxes in duplicate and covered with a horsehair net, and the boxes were buried 10, 20, 30, 50, 100, and 150 cm deep in manure in concrete silos, three for each type of manure. One silo of each manure was opened after 3 months and the remainder after 4 months. Germination tests showed that all seeds buried in the Krantz-method manure had lost their vitality. In the ordinary manure only the *Chenopodium album* from 50-, 100-, and 150-cm depths showed a certain percentage of germinating seeds. Rootstocks of quackgrass did not sprout after either treatment.

Control of weeds in spring cereals [trans. title], G. Sundelin (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 427 (1933), pp. 13; Eng. abs., pp 12, 13.*)—Review of weed-control experiments in various parts of

Sweden indicated the value of providing favorable growth conditions for the crop, cultivation during the fallow year, and fall tillage. A spray of 3.5 to 4 percent sulfuric acid at the rate of 800 to 1,200 l per hectare appeared to have great possibilities as a control measure. Spraying with iron sulfate and Raphanite or dusting with calcium cyanamide were also effective, but they were expensive. Nitrogenous sprays, as a mixture of sulfuric acid with ammonium sulfate or a 20 percent solution of sodium nitrate, as a general rule could not be recommended.

[Weed control in California] (*Calif. Dept. Agr. Mo. Bul., 22 (1933), No. 6, pp. 247–313, pls. 8, figs. 12*).—Devoted to the control of noxious weeds in California, this number comprises the following articles: Weed Control Makes History, by W. C. Jacobsen (pp. 249, 250); Weed Control (pp. 252–257) and Artichoke Thistle (pp. 269–272), both by W. S. Ball; Camel Thorn (pp. 258–260), Spiny Clotbur (p. 278), Perennial Sow Thistle (p. 286), and Poverty Weed (p. 305), all by W. S. Ball and W. W. Robbins; Introduction and Control of Camel Thorn, by A. E. Bottel (pp. 261–263); Progress in Chemical Weed Control, by A. S. Crafts (pp. 264–268); Weeds as a Factor in the Spread of Plant Diseases in California, by M. R. Harris and G. L. Stout (pp. 273–277); The Relation of Weeds to Insect Pests, by S. Lockwood (pp. 279–282); Noxious Weed Seeds Found in Crop Seeds, by L. Bunting (pp. 283–285); Hoary Cress, by M. K. Bellue and W. S. Ball (p. 287); New Weeds Confused with Hoary Cress, by M. K. Bellue (pp. 288–293); The Star Thistles, by W. S. Ball, W. W. Robbins, and M. K. Bellue (pp. 294–298); Weed Control by Means of Soil Sterilization, by P. M. Goodwin (pp. 299–301); Buried Seed Experiment, by W. L. Goss (pp. 302–304); and Progress of Pest Eradication in California, by H. J. Ryan (pp. 306–313).

HORTICULTURE

[Horticulture at the Alaska Station] (*Alaska Col. Sta. Bul. 2 (1932), pp. 7, 8, 9, 10, 33–36, figs. 2*).—Brief reports are included on the results of cultural experiments and variety tests of blueberries and the breeding of edible peas at College, by G. W. Gasser, and upon acclimation trials with fruits and ornamentals and propagation tests of ornamentals at the Matanuska Substation, by B. B. Burroughs.

[Horticulture at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 293 (1933), pp. 4, 6, 20, 21, figs. 2*).—Herein are briefly discussed the results of studies in vegetable breeding; the development of a new type of mushroom spawn; the testing of vegetable varieties, by W. B. Mack and G. J. Stout; and the insulation of storage houses, by F. N. Fagan and R. D. Anthony.

Progress in methods of plant propagation, V. T. Stoutemeyer (*Iowa State Hort. Soc. Rpt., 67 (1932), pp. 170–178, figs. 2*).—At the Iowa Experiment Station the covering of scions of arborvitae, juniper, and spruce with certain paraffin and wax emulsions increased the percentage of successful unions materially. Time of year was also an important factor. In the case of blue spruce cuttings inserted in sand on an open bench on January 27, success was much greater than earlier or later. Sand and peat proved much more valuable than sand alone for rooting *Rosa multiflora* leaf cuttings, but in the case of forsythia and various other hardy shrubs and vines there was no appreciable difference.

The rôle of peroxidase in the deterioration of frozen fruits and vegetables, M. A. Joslyn and G. L. Marsh (*Science, 78 (1933), No. 2017, pp. 174, 175*).—Blanching of peas, string beans, and spinach for 2 minutes in water heated to 160° to 170°, 180° to 195°, and 165° to 180° F., respectively, prior to freezing storage enhanced the color, flavor, and texture of the products, Higher temperatures resulted in a loss of fresh flavor and the development of cooked flavors. Lower temperatures failed to hold the bright attractive green. Since peroxidase was present in the tissues of vegetables which retained their flavor during freezing storage, the authors suggest that it may not be the chief causative agent in deterioration. Tyrosinase and active proteases were not found. It is thought likely that other oxidizing systems may be involved in the deterioration of frozen vegetable products.

Methods of breeding onions, H. A. Jones and S. L. Emsweller (*Hilgardia [California Sta.], 7 (1933), No. 16, pp. 625–642, figs. 12*).—Essentially an outline of practices which have been developed and followed at the California Station in breeding and improving onions, this paper discusses the development of the inflorescence and the flower, methods of handling plants for selfing, methods of increasing seed, crossing, harvesting, and curing seed, growing seedlings, and transplanting, supplemented with an outline of a breeding program for the improvement of onion varieties.

In 1923 Australian Brown onion flower heads (1) open pollinated, (2) bagged and wind shaken, and (3) bagged and tied to stakes yielded 712, 157, and 54 seeds per head, respectively. In 1924 Ebenezer heads (1) open pollinated, (2) emasculated and open pollinated, (3) bagged and shaken by hand, (4) bagged and wind shaken, and (5) bagged before the bracts broke and wind shaken yielded 1,000, 580, 205, 99, and 85 seeds per head. A table is presented showing the seed yield at Davis, Calif., from bagged plants of different varieties over a period of years.

Changes in the pectic constituents of tomatoes in storage, F. LeCrone and E. S. Haber (*Iowa State Col. Jour. Sci., 7 (1933), No. 4, pp. 467–476, figs. 3*).—As established by this study at the Iowa Experiment Station, there occurs in the ripening tomato whether on the vine or in storage an increase in the percentage of soluble pectin. The rate of change from insoluble to soluble pectin varied directly with the temperature, but there was a decrease in soluble and total pectin at the highest storage temperature employed, 21.1° C. (70° F.). A temperature of 10° C. was found more satisfactory than either 2.2° or 21.1° for the keeping of ripe tomatoes from the viewpoint of ultimate quality and durability upon removal from storage.

Watermelon breeding, D. R. Porter (*Hilgardia [California Sta.], 7 (1933), No. 15, pp. 585–624, figs. 15*).—Discussing briefly the flowering habit of the watermelon and the technic of pollination employed in the study, the author reports that inbreeding of the Klondike variety resulted in the production of strains more homozygous with respect to skin color, rind thickness and toughness, flesh color, texture, solidity, and sweetness, seed size, and seed coat color. Inbreeding permitted the elimination of strains of undesirable shape and had no striking reducing effects on vegetative vigor through six generations. Strains were isolated with more or fewer fruits per plant and with larger or smaller fruits than the parent. Fruit setting following artificial pollination was favored by relatively low temperature and relatively high air humidity. Pollinations made before 9 a.m. were generally more successful than those later. On certain days when the temperature was high and the relative humidity low none of the selfed blooms set. Flowers with large ovaries were most successfully pollinated, and the vigor of the runner bearing the pistillate bloom was also a factor. Definite flowering peaks were not recorded.

Notes on the species of apples.—II, The Japanese flowering crabapples of the Sieboldii group and their hybrids, G. P. Van Eseltine (*New York State Sta. Tech. Bul. 214 (1933), pp. 21, figs. 10*).—In this, the second (E.S.R., 69, p. 367) of a series, the author reviews the species and hybrids of *Malus*, showed that selfing results in a very heavy first wave of abscission, with the remaining three correspondingly light, as compared with cross-pollination. The variety of pollen had little effect on the shedding of fruits. The causes underlying the several drops are discussed from the physiological aspect.

Some observations on the variability of the amount and composition of the ash of the Wagener apple under Nova Scotian conditions, W. A. DeLong (*Sci. Agr., 13 (1933), No. 8, pp. 505–511, fig. 1*).—Analyses at Acadia University, Nova Scotia, of ground dried fruits minus seeds and stems harvested from Wagener apple trees in a differential fertilizer experiment showed the following 3-year average percentages of ash—0.156, 0.248, 0.184, 0.175, 0.192, and 0.158, respectively, for the nitrate of soda, muriate of potash, superphosphate, basic slag, no fertilizer, and limestone plats. The potash plat yielded fruit strikingly low in phosphorus and calcium. On the basis of the percentage of the individual ash constituents in fresh fruit phosphorus and potash were lowest in the nitrogen-fertilized lot, and muriate of potash was the only fertilizer to increase total ash and potash contents materially.

Large seasonal variations in the amount of ash appeared to be closely related to the size of the crop, with climatic factors, such as rainfall, conceded of possible importance. No clear correlation could be established between mineral composition and keeping quality of the fruits.

The suitability of apples for baking as judged by size of core, T. J. Maney and B. S. Pickett (*Iowa State Hort. Soc. Rpt., 67 (1932), pp. 152–156, figs. 6*).—Measurements taken at the Iowa Experiment Station on a total of 33 varieties of apples, practically all desirable for baking purposes, showed striking variations with respect to the size of the core in relation to the diameter of the fruit, the range being from 1 to 4.3 in Baldwin to 1 to 2.3 in Northwestern Greening.

Pollination of Packham's Triumph pear, R. E. P. Dwyer and F. T. Bowman (*Agr. Gaz. N.S. Wales, 44 (1933), No. 7, pp. 516–526*).—Packham Triumph, a pear said to rate only second to Bartlett (Williams) in New South Wales, was found in studies at the Bathurst Experiment Farm to be highly self-unfruitful, setting only 1.44 percent in 7,000 self-pollinated blossoms, and the resulting fruits were either seedless or nearly so and generally of poor form. Bartlett proved an effective pollinizer for Packham, except that it bloomed a bit late. Josephine de Malines, Baronne de Mello, and Beurre Superfin, particularly the first named, were found exceptionally well adapted as pollinizers for Packham.

Exanthema in pears and its relation to copper deficiency, J. Oserkowsky and H. E. Thomas (*Science, 78 (1933), No. 2023, pp. 315, 316*).—Analyses at the University of California of the leaves of Bartlett pear trees affected with exanthema, of normal appearing leaves from the same trees, and of leaves from trees from localities free of the disease showed a wide variation in copper content, suggesting that the disease may be due to a deficiency of this element. Whether the effect is direct on nutrition or indirect by neutralizing the effects of soil toxins absorbed by the plant was not established.

Fertilizing citrus trees, I, II, L. D. Batchelor (*Calif. Citrogr., 18 (1933), Nos. 10, pp. 266, 284, 288, 289; 11, pp. 298, 308, 309*).—This is a general discussion of principles and practices, with special reference to the use of animal manures with and without supplements. Long continued studies at various locations in southern California showed that nitrogen always and organic matter usually give striking increases in growth and yield. In the experiments at Chaffey ammonium sulfate, cottonseed meal, tankage, and complete fertilizer were almost equally effective sources of nitrogen. In none of the experiments did phosphorus or potash exert any measurable influence on yield, growth, or quality of the fruit.

The composition and variability of dairy manures are discussed, with the comment that phosphates and potash are applied by manure in relatively greater amounts than nitrogen, and being much less subject to leaching there is no reason for supplementing manures with either element. The movement of nitrates in the soil, the loss of organic matter, and the amounts of fertilizing materials that may be profitably applied to citrus orchards are discussed.

Do oil sprays accumulate in the citrus tree? P. W. Rohrbaugh (*Calif. Citrogr., 18 (1933), No. 11, pp. 297, 307, figs. 3*).—Microscopic examinations at the University of California of stained leaf, shoot, and fruit tissues from trees sprayed with oil showed no significant difference in the amount of oil penetrating leaves with oil sprays of the same group number, nor was any evidence found of oil passing from the leaf into the branch. In the case of bark into which oil sometimes penetrated two thirds of the thickness, new bark was continually forming and pushing off the old. Providing a standard type of oil is used, the author believes there is little hazard of an accumulation of oil.

Relation of foliage to fruit size in Washington Navel oranges, A. D. Shamel, C. S. Pomeroy, and R. E. Caryl (*Calif. Citrogr., 18 (1933), No. 11, p. 296, fig. 1*).—Carried out in a commercial citrus orchard at Corona, Calif., this U.S. Department of Agriculture study showed that a limitation in June in the number of leaves on girdled branches to 10, 20, 30, 40, 50, and 60 per fruit resulted in a steady increase in fruit size up to the maximum number of leaves. At least 60 leaves per orange were required to yield fruits averaging 176 to the packed box.

Some differences between button-blossom halves of citrus fruits, L. J. Klotz and A. R. C. Haas (*Calif. Citrogr., 18 (1933), No. 11, pp. 318, 324, fig. 1*).—By covering half of each fruit with paraffin it was found that the button halves of grapefruit and Valencia oranges were strikingly more permeable to a permanganate solution than were the blossom halves. With lemons there was little difference, and with navel oranges the blossom end was the more permeable. Valencia oranges lost water more rapidly from the button portion. The average total sugar in the juice of the button and blossom halves of Valencia oranges was 7.19 and 9.61 percent, respectively, and in the button half there was 25 percent less osmotically active sugars and the stomata were farther apart. Much the same type of differences was observed in grapefruit but not to the same degree. The rate of water loss from lemons and Valencia oranges was materially increased when a twig with or without leaves was left attached. The possible relation of the data to internal decline of citrus fruit is discussed.

Pecan investigations in North Carolina, R. Schmidt (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 21–24*).—Data are presented on the yield, size, and quality of nuts produced in experimental plantations established by the North Carolina Experiment Station in 1906 at the Lower and Upper Coastal Plain Substations. From the results of the trials Stuart, Schley, Moneymaker, and Alley are recommended as the best commercial pecans for North Carolina. Sweetmeat, the heaviest yielding nut, produced an average of approximately 40 lb. of nuts per tree per year from 1915 to 1928. Monarch produced the largest nuts, 59 per lb., but was classified as only fair in quality.

Stocks for pecans, B. Szymoniak (*Natl. Pecan Assoc. Proc., 31 (1932), p. 97*).—Measurements by the Louisiana Experiment Station of the growth of seedling pecans grown from seeds of several varieties carefully graded into large, medium, and small sizes showed very little difference in diameter due to the size of the seed. The best growth was made by *Hicoria aquatica.* Soil had a greater effect on seedling size than did the size of the seed, and no difference was noted in germination as related to seed size.

Results that may be expected to follow the pruning of bearing pecan trees, H. L. Crane (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 2–8*).—In studies carried on by the U.S. Department of Agriculture near Albany, Ga., pruning of pecan trees in all cases greatly stimulated growth, the greatest gains being, however, where the pruning was accompanied by an application of nitrogen fertilizer. Increased growth was manifested both in girth increment and in longer shoots, and is explained by the hypothesis that the removal of superfluous wood permitted a more effective utilization of synthesized foods. Slight but insignificant yield gains were recorded in some cases, and in no case were total yields reduced following pruning.

Liberal applications of quickly available nitrogen either in the fall or spring increased yields decidedly. Nuts produced on pruned trees were larger and, as based on a single season's observations, were better filled. Furthermore, effective spraying was facilitated by opening of the tree top.

Pollination control, period of receptivity, and pollen viability in the pecan, C. L. Smith and L. D. Romberg (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 83–87, fig. 1*).—At Denison, Tex., pistillate flowers of Burkett, Schley, Success, and Texas Prolific pecans were found by the U.S. Department of Agriculture to be receptive for 18, 19 to 20, 24, and 28 days, respectively. The periods of pollen shedding were briefer; they were not always coincident but in every case overlapped the receptive period of the same variety. It was found that pollen remains viable for several days; in fact Success pollen produced sets for as long as 12 days, whereas Schley pollen became ineffective after the eighth day.

Cellophane bags proved superior to paraffined cloth sacks for protecting pollinated flowers because of their lighter weight, greater transparency, and greater permeability to moisture.

Methods of controlling pollination in the pecan, H. P. Traub and L. D. Romberg (*Jour. Agr. Res. [U.S.], 47 (1933), No. 5, pp. 287–296, figs. 4*).—In these studies carried on by the U.S. Department of Agriculture in Texas the covering of the pistillate flowers of the pecan with a finely woven cloth bag previously dipped in boiling paraffin of low melting point was found successful in excluding undesired pollen, and when the neck was stuffed with soft cotton adequate ventilation was provided for the developing nuts and subtending foliage. Pollination was easily effected by means of a hypodermic needle inserted through the sack, the resulting opening being sealed with paraffin. The technic of the operation is discussed in detail.

Preliminary report of the influence of cultural practices on yield, size and quality of pecans, B. G. Sitton, A. O. Alben, R. D. Lewis, and J. L. Pelham (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 43–46*).—The importance of adequate soil moisture in pecan production was indicated in cultural studies carried on by the U.S. Department of Agriculture at Winona, Tex. Here the fertilized trees uncultivated except for a light disking at time of applying the fertilizer made less growth and yielded less nuts than did unfertilized cultivated trees, the resulting difference being due apparently to the greater weed cover on the lightly cultivated and fertilized area.

In another test trees in a plat seeded to Austrian winter peas and permitted to stand without cultivation the subsequent season produced fewer and lower quality nuts than did trees in plats where the pea cover crop was turned under in spring. Irrigation improved materially the size and the filling of Stuart and Moneymaker pecans on trees growing in a fine sandy loam.

Can the composition of pecan nuts be changed by fertilizer or other cultural treatment? M. B. Hardy and H. L. Crane (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 110–117*).—Analyses by the U.S. Department of Agriculture of pecan meats taken from nuts the same size but of different varieties showed that varieties differed markedly in composition. Pabst and Schley had approximately 4 to 6 percent greater oil and a lower protein content than did Stuart. Stuart nuts from vigorous trees were from 3 to 6 percent higher in protein content than similar sized nuts from weakly vegetative trees. The effect of size on percentage composition of otherwise comparable nuts was inconclusive, the frequent inconsistencies preventing deductions. None of various fertilizer or pruning treatments had any important or consistent effect on nut composition, but through the promotion of better filled nuts did influence quality. The better filled nuts of any variety had the higher oil content and the lower protein content.

Prepollination spraying of pecans for insects and diseases, H. Baker and J. R. Cole (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 55–58*).—The authors' experiments with Bordeaux mixture and calcium arsenate or lead arsenate would seem to indicate that an application of a prepollination spray would be noninjurious to the foliage and pistillate flowers in localities where the climatic conditions are similar to, or approximating, those of Louisiana and east Texas.

Cold storage experiment with pecans: A preliminary report, G. H. Blackmon (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 88–96*).—At the Florida Experiment Station pecan nuts were kept in fresh condition from one crop season to the next by placement in cold storage at 32° F. as soon as they were thoroughly dry and before their oils began to break down. The belief is expressed that changes which precede rancidity are initiated before being revealed by taste. Of various experimental packs, namely, vacuum, nitrogen, carbon dioxide, oxygen, and cellophane, tested for keeping pecans, nitrogen storage was most promising, with none equaling low temperature storage. Vacuum storage was next to nitrogen in merit.

Commercial possibilities of Japanese mint in the United States as a source of natural menthol, A. F. Sievers and M. S. Lowman (*U.S. Dept. Agr., Tech. Bul. 378 (1933), pp. 35, figs. 13*).—Japanese mint (*Mentha arvensis piperascens*), resembling in habit of growth and propagation the peppermint (*M. piperita*), is said to yield oil with from 75 to 85 percent of menthol, as compared with 50 percent in peppermint oil. However, the Japanese oil lacks the pleasant aromatic flavor of the American product. Analyses of material produced in planting trials conducted in various parts of the country showed that oil produced in the North and West contained generally a larger percentage of total menthol than that produced in the Southeast. Seasonal conditions affected the menthol content, but there was observed no tendency for menthol to decline gradually as a result of the prevailing environment in any one locality. In California, the only State in which Japanese mint has been grown commercially, three cuttings were obtained annually after the first year yielding a total of from 55 to 90 lb. of oil per acre.

Date of flowering as affected by climatic temperature, J. F. A. Maclagan (*Plant Physiol., 8 (1933), No. 3, pp. 395–423, figs. 8*).—An analysis at Edinburgh University, Scotland, of flowering records taken over a period of about 10 years on several species of Rhododendron, Cytisus, and Syringa as related to temperature data for the same period showed a significantly consistent response to the temperature of distal and proximal or proximal and immediate weather belts. The comparatively narrow limits of time during which deviations of temperature may influence time of bloom are believed to synchronize with activity of spore formation within the plant. The effective periods varied with genera and with species within the genera.

Ornamental trees, H. Mowry (*Florida Sta. Bul. 261 (1933), pp. 136; figs. 97*).—Accompanied in many cases by illustrations of the tree, foliage, flowers, or fruit, descriptive information is presented on a large number of native and introduced trees that flourish in Florida. In addition, general information is presented on culture and pruning, and the various species are classified as to flower, leaf, and fruit characters and desirability for coastal, windbreak, and other uses.

Insects and diseases of ornamental trees and shrubs, E. P. Felt and W. H. Rankin (*New York: Macmillan Co., 1932, pp. XIX+507, figs. 243*).—With the body of the text arranged largely in an alphabetical manner according to host plants, information is presented on respective insect and fungus pests and the best methods of control as based on available knowledge.

FORESTRY

[Forestry at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 293 (1933), pp. 9, 20, fig. 1*).—Information is presented on the harmful effects of black walnut trees on jack pine growth; and on the growth of canoe birch planted following the cutting of oak, by J. A. Ferguson.

The relation between collecting date and maturity of red pine seed, A. S. L. Barnes (*Forestry Chron., 9 (1933), No. 1, pp. 48–59, figs. 3*).—In the fall of 1932 50 cones of red pine gathered daily from the same trees from August 25 to September 24 were placed in a covered drying shed and extracted in early November. During the curing period the cones picked before September 3 turned an undesirable color, while those harvested later assumed the natural rusty red. In addition extraction was difficult for the early cones. Often cones outwardly similar varied in seed content to a marked degree. No significant difference in the weight of the extracted seed was observed between the early and late harvests within 4 months after collection, but germination trials made approximately 2 months after date of collection showed distinctly in favor of mature seed. The mature seed germinated more rapidly and was freer from molds. Seed from trees over 35 years of age matured from 3 to 4 days earlier than that from younger trees. No delayed germination was noted in either the mature or immature seed if germinated within 4 months of collection.

Direct seeding in Ontario, G. Bayly (*Forestry Chron., 9 (1933), No. 1, pp. 66–78, fig. 1*).—Seedings made at various points in Ontario showed that jack pine can be established by direct sowing, but that on small areas, at least, the sowing of white and red pines is not uniformly successful. Delayed germination was an important factor in the successful seeding of jack pine because of the reduction of hazards from unfavorable weather. Moss, sand, and bracken were the most favorable sites for establishing jack pine. The planting of red and white pine transplants was successful except on rocky burned-over lands where the expense was excessive.

Results of a project in hybridizing poplars, A. B. Stout and E. J. Schreiner (*Jour. Heredity, 24 (1933), No. 6, pp. 216–229, figs. 6*).—In this study, carried on jointly by the New York Botanical Garden and the Oxford Paper Company, there were produced approximately 13,000 poplar seedlings involving 34 different parents, including white poplars, aspens, black poplars, cottonwoods, and balsam poplars. From the progeny there were selected 69 seedlings considered of high promise in the production of pulpwood. Among parents that yielded promising seedlings were the necklace poplar (*Populus deltoides*), *P. charkowiensis*, *P. nigra*, *P. berolinensis*, *P. maximowiczi*, and *P. trichocarpa*. Ten of the hybrids have been named as follows: Andover, Androscoggin, Frye, Geneva, Maine, Oxford, Rochester, Roxbury, Rumford, and Strathglass. The chief value of these new poplars is said to rest in their rapid production of pulpwood, excelsior, and other products.

Redwoods and frost, H. D. MacGinitie (*Science, 78 (1933), No. 2018, p. 190*).—Noting considerable injury to the young growth and foliage of the coast redwood (*Sequoia sempervirens*) in the northern limits of its range in Del Norte and Humboldt Counties, Calif., from frosts in early December, which reached a low of 22° F., the author concludes that occasional cold winters may be the factor limiting the northern advance of this species.

The growth of Thuja plicata in Britain, A. C. Gray (*Scot. Forestry Jour., 47 (1933), pt. 1, pp. 19–24, figs. 3*).—*T. plicata*, the only one of 7 species of the genus said to be of silvicultural value in Great Britain, attained in one particularly good plantation at 28 years of age an average height of 47.5 ft. and an average girth at 4 ft. 3 in. of 19.5 in., based on 1,816 trees per acre left after thinning out 262 trees which averaged 39 ft. in height.

Experimental cutting of spruce and fir in the Adirondacks, A. B. Recknagel, H. L. Churchill, C. Heimburger, and M. Westveld (*Jour. Forestry, 31 (1933), No. 6, pp. 680–688, fig. 1*).—Believing that the cutting cycle for pulpwood in the Adirondack spruce region should not exceed 25 or 30 years, five 30-acre plats were laid out in 1930 in a typical mixed spruce-hardwood forest near Newcomb, N.Y., with the following cutting treatments: (1) All hardwoods left and all spruce and fir 5 in. or over in diameter at breast height removed, (2) hardwoods left and spruce cut to 8 in. and fir to 6 in., (3) hardwood left and spruce cut to 12 in. and fir to 10 in., (4) no cutting in 1930 but hardwoods girdled selectively in January 1931, and (5) no treatment. A total of 9.12, 8.27, and 4.38 cords of pulpwood were removed from plats 1, 2, and 3, respectively. Prior to cutting all plats contained an adequate stocking of pulpwood species, but losses of pulpwood reproduction in logging averaged 48.6, 52.9, and 42.6 percent, respectively, for plats 1, 2, and 3.

Measures for stand improvement in southern Appalachian forests, C. R. Hursh et al. (*U. S. Dept. Agr., Forest Serv., Emergency Conserv. Work, Forestry Pub. No. 1 (1933), pp. III+57, pls. 8, figs. 4*).—Designed to assist foresters, particularly those who have had no previous experience in the region, this publication discusses the various forest types, points out the comparative silvicultural value of the principal species, and outlines general improvement measures, which include the betterment of old growth, second growth, and new growth stands and the prevention of erosion. Appended is information relating to southern Appalachian forest types as recognized by the committee on forest types of the Society of American Foresters, principal forest trees native to the southern Appalachians, shrubs and vines common in the southern Appalachians, tree species common in the southern Appalachians grouped according to shade tolerance, and important forest insects of the southern Appalachians.

Soil reaction and forest types in the Duke Forest, T. S. Coile (*Ecology, 14 (1933), No. 4, pp. 323–333, fig. 1*).—H-ion concentration determinations by the colorimetric method on soil samples taken from beneath the following forest types, namely, loblolly pine, shortleaf pine, white oak-black oak-red oak, post oak-blackjack oak, red gum-yellow poplar, river birch-sycamore, and red cedar in the Duke University Forest in North Carolina showed very small differences in the reaction of the mineral soil, probably insufficient to be of importance in determining the distribution of forest types. The acid reaction of the organic soil layers under loblolly and shortleaf pines was such as to suggest the possibility of its being a limiting factor in the establishment of seedlings of certain species. Litter of loblolly pine, shortleaf pine, and of oaks had a relatively high H-ion concentration, while that of red gum, yellow poplar, red maple, river birch, sycamore, and dogwood was of a low H-ion concentration.

Tree planting to reclaim gullied lands in the South, H. G. Meginnis (*Jour. Forestry, 31 (1933), No. 6, pp. 649–656, figs. 2*).—Of various species tested in erosion control projects in Mississippi loess uplands, black locust, shortleaf pine, and loblolly pine proved of outstanding value for planting in gullies. In all three species the larger planting stocks showed the greater survival at the end of the first year. Pruning back black locusts 1 month after planting in an effort to secure sprouting decreased survival by 10 percent. Loblolly pine did not thrive as well as shortleaf pine on the drier and less fertile soils, but due to its rapid growth rate is considered more desirable on better quality sites.

The wood cylinder method of measuring forest inflammability, H. T. Gisborne (*Jour. Forestry, 31 (1933), No. 6, pp. 673–679, figs. 2*).—The fluctuation in weight of cylinders of ponderosa pine sapwood 18 in. in length and 0.5, 1, and 2 in. in diameter was used successfully as an index to air moisture conditions and the incident fire hazards. Carefully calibrated in advance with due allowance for natural variation in water-absorbing capacity, the cylinders gave an accurate picture of hygroscopic conditions. In exposing of cylinders a site was selected about half way between full sun and half shade and direct exposure to rainfall.

DISEASES OF PLANTS

The environmental coincidence as a factor in incidence and control of plant diseases, T. D. Jarvis (*Sci. Agr., 13 (1932), No. 1, pp. 36–57*).—The author reports ecological investigations pointing to a definite relationship between the geographical distribution of plants and the incidence of certain types of pathological disturbances.

The variability in incidence of disease and in manifestations of specific pathogens on a single crop under specific cultural and environmental conditions indicate the presence of some predisposed factor not consistently associated with either specific plant varieties, pathogens, or environmental coincidences. Studies of viruses on potato, sugarcane, and sugar beet; rust on wheat (*Puccinia graminis* and *P. glumarum*); and blade blight on oats (*Bacillus avenae*) show that resistance of a host to specific pathogens is relative and largely local, being the result of specific interrelationships of the host, environment, and pathogen. A plant or variety may possess immunity in one growth coincidence, varying degrees of resistance in a second, and extreme susceptibility in a third, i.e., varieties of potatoes which show total resistance to virus infection in the Dutch Fresian region in the Netherlands for 70 years show no consistent resistance after international distribution for seed. On the other hand, there is no definite association between a specific environment and incidence of these diseases except in relation to individual plants and varieties.

A plant's power of adjustment to new environments is in proportion to the limitation of its accumulated tolerance to varying coincidences of environmental factors. Survival in its natural habitat indicates that the plant has developed tolerance to all the fluctuations which may occur within this zone and consequently can resist pathogenic invasion. On removal from this habitat it tends to establish similar adjustments in new environments, a struggle ensues between its accumulated tolerance resulting from its composite experience in the struggle for survival on the one hand, and the changes in response necessary for adjustment to new environment on the other. The plants able to withstand this period of disturbed metabolism survive and thus widen the scope of their accumulated tolerance. The total inherited tolerance of any plant to environmental changes is merely the consolidation of these successful adjustments to past environments. Species and varieties which have suffered the widest and most rapid distribution in proportion to limitations of natural habitat show the greatest susceptibility to invasion by parasites, and, likewise, the improved commercial strains developed under specific environmental coincidences by complex crossbreeding show the greatest degree of metabolic disturbance under wide and indiscriminate distribution and the greatest variability in expression of pathogenic invasion. Changes in environmental coincidence may result from geographical distribution, from changes in dates of seeding in a single locality, or from variation of any factor in environments under which experiments are conducted, i.e., a greenhouse or field in the same locality and with identical dates of seeding.

Breeding for resistance to disease must progress on a foundation of locally resistant strains, and investigators must recognize the significance of a specific coincidence of the host, pathogen, and environment in relation to incidence of disease.—(*Courtesy Biol. Abs.*)

Efficacy and economic effects of plant quarantines in California, H. S. SMITH, E. O. ESSIG, H. S. FAWCETT, G. M. PETERSON, H. J. QUAYLE, R. E. SMITH, and H. R. TOLLEY (*California Sta. Bul. 553 (1933), pp. 276, figs. 2*).—Beginning with a general discussion of plant quarantines and their biological, economic, and administrative aspects in California, including the difficulties in enforcement due to the large area and diverse topography, the authors analyze the various existing plant quarantines administered for the protection of California agriculture. In these analyses the pests are stated, their range and destructiveness discussed, and the need of the quarantine evaluated.

[Plant disease studies of the Pennsylvania Station] (*Pennsylvania Sta. Bul. 293 (1933), pp. 23, 24, 38*).—Data are briefly noted on tobacco wildfire, by W. S. Beach; smut-resistant varieties of wheat and oats, by C. F. Noll; blight-resistant varieties of pears, by E. L. Nixon; and distribution of West Indian rusts, by F. D. Kern, H. W. Thurston, Jr., and R. Ciferri.

Report of provincial plant pathologist, J. W. EASTHAM (*Brit. Columbia Dept. Agr. Ann. Rpt., 27 (1932), pp 29–34*).—This is a progress report of station work on apple scab, rot and break-down of field tomatoes, raspberry diseases and injury by cold and mammals, anther and stigma blight of loganberry (shown to be due to *Hapalosphaeria deformans* and believed to be the first record for this host and for the fungus in North America), and of work on winter wheat and bunt.

Virus disease investigations, H. H. STOREY (*East African Agr. Res. Sta., Amani., Ann. Rpt., 5 (1933), pp. 13–17*).—This is a progress report on studies of plant virus diseases, with special reference to *Cicadulina mbila* as a vector of streak disease of maize.

The author bred races of this species able and unable, respectively, to transmit the virus, and developed a technic for mechanical inoculation of the virus into insects, consisting of introducing the virus-bearing fluid into a puncture in the abdomen or leg with a finely-pointed needle or glass micropipette under the microscope. By the same technic it is possible to pick up on a needle fluids from different parts of one insect and transfer them to other insecets. By these methods he proved that after feeding on a diseased maize plant *C. mbila* will have the virus in the contents of its rectum. When these contents are voided as feces, the virus seems to disappear rapidly. A few hours after its first feeding on a diseased plant the active insect was found to have the virus in its blood, and after a further few hours' delay it began to cause infection of plants upon which it fed.

Other species of sucking insects were inoculated with the streak virus, and *C. mbila* with the viruses of maize stripe and mosaic diseases, and it was found that in behavior to a particular virus insects fall into three classes: (1) Those able to transmit, (2) those unable to transmit normally owing to a mechanism of resistance that may be overcome by suitable treatment, and (3) those apparently entirely unable to transmit under any circumstances. Breeding work with *C. zeae* has given a clear indication that the power to transmit the streak virus is controlled by a hereditary factor.

A note on the progress of studies of tobacco leaf curl is included.

Ultravirus diseases of plants [trans. title], M. A. BEAUVERIE (*Ann. Serv. Bot. et Agron. Tunisie, 9 (1932), pp. II+1–175, pls. 8*).—This article thoroughly reviews the modern literature on plant viruses, citing 762 articles. The host index lists mosaic diseases of 186 species in 33 families of plants. Other viruses, including curly top and infectious chlorosis, are listed in 67 species. The main economic viruses are discussed. Four theories have been proposed to explain the cause of virus diseases as follows: Filtrable viruses or ultraviruses, enzymes, protozoa, or bacteria. A comparative study of viruses is facilitated by ultrafiltration, chemical agents, electric currents, heat, and desiccation.—(*Courtesy Biol. Abs.*)

Parasitic and other fusaria counted in tropical soils, O. A. REINKING and M. M. MANNS (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 6 (1933), No. 1, pp. 23–75, figs. 2; Ger. abs., pp. 73, 74*).—Fifteen tropical soils, of which 14 were distinct soil types, were investigated for the presence of parasitic and other species in the genus *Fusarium*. The relative number and distribution per gram of soil for these fusaria were determined for each soil type, a variety of meterological conditions being represented.

Twenty-four fusaria, included in 8 different *Fusarium* sections, were isolated from the various soil types, the largest number being from the section Elegans, which includes the vascular wilt disease producing organisms. Certain types were commonly found in all soils tested, while other types were found only in certain soils.

The different fusaria isolated were classed according to their ability or lack of ability to develop generally in the surface and depth of various soil types into typical soil fusaria and mere soil invaders. Because of their widespread presence in the various soil types, the following fungi have been provisionally classified as soil fusaria: *F. dimerum, F. equiseti bullatum, F. moniliforme, F. bulbigenum, F. oxysporum* f. 5, *F. oxysporum aurantiacum, F. solani minus, F. solani martii* f. 1, *F. solani eumartii*, and *F. javanicum theobromae* (*Hypomyces ipomoeae*). Because of the scarcity of the fungi and the special local conditions under which some isolations were made, the following fungi have been provisionally classed as soil invaders: *F. decemcellulare, F. chlamydosporum, F. semitectum, F. camptoceras, F. diversisporum, F. scirpi, F. scirpi caudatum, F. moniliforme maius, F. orthoceras, F. orthoceras triseptatum, F. oxysporum, F. oxysporum* f. 3, *F. vasinfectum lutulatum*, and *F. javanicum ensiforme*.

Bacterial diseases of plants occurring in Formosa, I–III, N. OKABE (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 4 (1932), No. 4, pp. 470–483, figs. 5; 5 (1933), Nos. 1, pp. 26–36, figs. 3; 2, pp. 157–166, figs. 4*).—In the first of these three papers the author reports studies of bacterial pustule of soybean due to *Bacterium phaseoli sojense*, bacterial leaf spot of castor-bean due to *B. ricini*, citrus canker due to *B. citri*, bacterial black spot of radish due to *B. maculicolum*, angular leaf spot of cotton due to *B. Malvacearum*, and black rot of crucifers due to *B. campestre*. Part II deals with bacterial leaf spot of tomato due to *B. tomato* n.sp., and bacterial red stripe disease of sugarcane leaves due to *B. rubrilineans*. Part III takes up bacterial blight of mulberry due to *B. mori*, bacterial leaf spot of jute due to *B. sojae japonicum*, and bacterial leaf spot of jute due to *B. nakatae*, new type B. The last named differs from *B. nakateae* in producing brown pigment, H_2S, capsules, and acid from sugars—the first two characters being most distinctive.

Effect of environmental and cultural factors on the dwarf disease of alfalfa, J. L. Weimer (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 6, pp. 351–368, figs. 4*).—Dwarf, a recently described alfalfa disease whose cause is yet unknown, is held largely responsible for the rapid dying of alfalfa plants in southern California. Plats at the California Experiment Station's farm at Riverside, irrigated twice each month during the growing season and cut regularly, were worthless for commercial hay production by the middle of the fourth year, whereas other plats, similarly treated but not irrigated during the seed-growing period, had fair stands at the end of the fourth year. The experimental evidence confirmed field observations that soil moisture markedly affects the severity of dwarf and consequently the premature dying of alfalfa. It hardly seemed commercially practicable to keep the soil moisture low enough to control dwarf and yet to maintain production at a desirable level. Time of cutting, temperature, or soil type did not appear to be major factors in the severity of the disease. Neither manure, superphosphate, lime, sulfur, potassium, or a number of other elements ordinarily used in small quantities by plants, were effective in controlling dwarf or prolonging the life of the stand.

Etiology of the chocolate spot disease of broad beans, J. C. Magee (*N.S. Wales Dept. Agr., Sci. Bul. 43* (*1933*), *pp. 8, pls. 2*).—The author concludes that the deposition of honeydew by aphids on broadbean foliage is the cause of the spotted condition known as the chocolate spot disease, which has hitherto been regarded as a bacterial malady. This disease, formerly thought to be an important factor in crop failures and confused with losses caused by the root- and crown-rotting organisms, *Rhizoctonia* sp. and *Sclerotinia sclerotiorum* in New South Wales, is now considered to be of minor significance.

The control of finger and toe of broccoli in County Down, D. W. Baillie and A. E. Muskett (*Jour. Min. Agr. North. Ireland, 4* (*1933*), *pp. 44–46. pl. 1*).—Experimental results gave very satisfactory confirmation of recent work with regard to the use of corrosive sublimate for control of finger-and-toe of Brassicae. In this case corrosive sublimate was the only material which controlled the disease sufficiently to enable the crop to be grown at a profit.

Studies on some characters of Corticium centrifugum parasitic on calabash plant, T. Watanabe (*Utsunomiya Agr. Col. Bul. 3* (*1933*), *pp. 1–16, pl. 1*).—*C. centrifugum* attacks the stem of calabash (*Lagenaria vulgaris depressa*) in the field in August. A mycelial mass appears on affected areas. As the disease progresses the areas change color, become deeply sunken, and later numerous sclerotia are formed there. The areas, and often the stem portion above them, die or wilt. Vigorous growth of the mycelia and the abundant formation of sclerotia occurred on soy agar and apricot decoction agar. Asparagine synthetic and Richard's solution were very poor in these respects, and a characteristic mycelial layer was produced on agar medium of the former.

On soy agar (Miyoshi's formula) mycelium failed to grow, but large irregular shaped, flattened sclerotia were produced. The minimum temperature for the mycelial growth on apricot decoction agar, soy agar, and carrot decoction agar lies between 11° and 15° C.; the optimum is about 28°; and the maximum seems to be above 38°. This fungus attacks also rice (paddy and upland), tomato, pepper, broadbeans, squash, cucumber, "sennarihyotan" (*L vulgaris microcarpa*), "yugao" (*L. vulgaris clavata*), watermelon, "hechima" (*Luffa cylindrica*), and sweetpotato.

Vitality of Corticium centrifugum parasitic on calabash plant, T. Watanabe (*Utsunomiya Agr. Col. Bul. 3* (*1933*), *pp. 17–27*).—The results of study on the overwintering of *C. centrifugum* causing Shirakinu disease of calabash (*Lagenaria vulgaris depressa*) and on the resistance of the fungus to high temperature and to various kinds of chemicals are reported. The sclerotia and mycelia in the soil, on the host, and on the culture media passed the winter alive at Utsunomiya, Japan. Under water the sclerotia were completely killed in 50 minutes at 50° C. and mycelia in 30 minutes at 45°, and in the air the sclerotia were killed in 60 minutes at 60° and mycelia in 20 minutes at 60°. The order of injury of chemicals for the sclerotia and mycelia is as follows: Corrosive sublimate, formalin, caustic potash, ashes (A and B), milk of lime, Bordeaux mixture, self-boiled lime-sulfur, alcohol, flowers of sulfur, copper sulfate, and ash (C).

Hypertrophy and anomalies of the ♂ inflorescence of corn caused by Ustilago maydis [trans. title], R. Piacco (*Gior. Risic.*, *23* (*1933*), *No. 8*, *pp. 177–181*, *figs. 3*).—The anomalies are described and figured.

The effect of seed disinfection upon the oat crop, A. E. Muskett and H. Cairns (*Jour. Min. Agr. North. Ireland*, *4* (*1933*), *pp. 105–115*).—The authors found that smut diseases of oats may be almost as satisfactorily controlled by dusting the seed grain with an organic mercurial powder as by treatment with formaldehyde. Copper compounds were of some value as fungicides but caused definite crop injury, while sulfur had no fungicidal value for oat smuts. As general seed disinfectants, the organic mercurial dusts used were of greater value than formaldehyde. The average increase in grain yield resultant on mercurial treatment was approximately 25 percent above the yield consequent on formaldehyde treatment, which, in turn, showed an increase of 14 percent above the controls.

Potatoes (*Alaska Col. Sta. Bul. 2* (*1932*), *pp. 8, 9*).—Tests of seed stock and soils to ascertain their freedom from virus diseases, such as mosaic, are briefly noted.

Virus and viruslike diseases of the potato in the Northwest and their control, M. B. McKay, T. P. Dykstra, H. E. Morris, P. A. Young, B. L. Richards, and H. L. Blood (*U.S. Dept. Agr. Circ. 271* (*1933*), *pp. 32*, *pls. 8*, *figs. 21*).—Information detailed on characteristics of and control measures for virus diseases of potatoes in the Northwest, including mild, crinkle, rugose, leaf-rolling and other mosaics, leaf roll, witches'-broom, and spindle tuber, and other troubles that are or resemble virus diseases—calico, psyllid yellows, and giant hill—was derived from investigations made by the Montana, Oregon, and Utah Experiment Stations, and the U.S. Department of Agriculture, cooperatively and independently.

Tuber indexing is considered the most nearly ideal method for eliminating virus diseases from the seed stock, but is practicable only in very special cases. Hill indexing is unreliable for virus-disease control. Under proper conditions roguing in tuber-unit-planted seed plats will give results that are about as effective as tuber indexing. This plan is much more generally practicable and should be used widely wherever home-grown seed can be maintained in good productive condition.

A study of the crinkle disease of potatoes and of its constituent or associated viruses, P. Clinch and J. B. Loughnane (*Roy Dublin Soc. Sci. Proc., n.ser., 20 (1933), No. 40, pp. 567–596, pls. 2*).—The potato diseases known as simple mosaic, interveinal mosaic, crinkle, and up-to-date streak are described, and an account is given of the effects produced on inoculation of each disease into other solanaceous hosts, e.g., tobacco and *Datura stramonium.*

The question of the composite nature of potato virus diseases is discussed, and the theory is advanced that crinkle is a mixture, rather than a compound, of two viruses, each of which belongs to a distinct type.

Tests of certain dusts and ready-made sprays for the control of potato blight in comparison with Burgundy mixture, P. A. Murphy and R. McKay (*[Irish Free State] Dept. Agr. Jour., 32 (1933), No. 1, pp. 30–48, pls. 2*).—In comparison (1927–30) of various dusts with Burgundy mixture (2 percent) for control of potato blight, the latter gave more reliable protection and proved more profitable, particularly when the attack was severe. The best results with the dust were secured from the use of large quantities. The features which make 2 percent Burgundy mixture so effective in controlling potato blight in Ireland are (1) the check which it gives to growth, thus preventing unduly rank development and continued growth after the last application of spray, and (2) its permanency on the foliage.

Dry rot of potatoes caused by a Fusarium, S. Riccardo (*La cancrena secca delle patate per "Fusariosi" in Provincia di Napoli. In Ricerche, osservazioni e divulgazioni fitopatologiche, per la Campania ed il Mezzogiorno, II. Portici (Napoli): R. Lab. Patol. Veg., 1933, pp. 3–16, pls. 2, fig. 1*).—A *Fusarium* was isolated from potato tubers, its principal morphological-physiological properties being identical with those of *F. oxysporum.* The author states that drought and heat during and preceding digging favor spread of the disease. It is possible that Acarina may play an important part in the dissemination of the conidia in the soil and in the storage ditches.

The author advises against keeping potatoes in ditches, as is customary in Napoli (Naples), and suggests heaping them in conical masses on well-beaten soil and covering them with a layer of straw and beaten earth, with small lateral apertures for ventilation and a surrounding ditch for the escape of water.

A possible means of keeping potatoes safely in ditches is suggested, and it is added that they must be selected carefully to eliminate all immature, cut, or, in any way, injured tubers.

Studies on the physiological specialization of Gibberella fujikuroi, the causal fungus of the rice "bakanae" disease [trans. title], Y. Nisikado and H. Matsumoto (*Tottori Nôgaku-Kwaihô (Trans. Tottori Soc. Agr. Sci.), 4 (1933), No. 3, pp. 200–211; Eng. abs., p. 210*).—Inoculation experiments on 66 strains of *G. fujikuroi* collected from various regions of Japan and of 5 strains of *Fusarium moniliforme* and its variety *F. moniliforme majus* were undertaken. Maize seedlings were inoculated in place of rice, as the bakanae symptom appeared more clearly on maize. The pathogenicity of various strains was compared by the degree of the overgrowth of inoculated maize seedlings. According to the results, the various strains of the fungus show a high differentiation in their pathogenicity.

Influence of salt on the pathogenicity of Hypochnus sasakii Shirai [trans. title], S. Endo (*Tottori Nôgaku-Kwaihô (Trans. Tottori Soc. Agr. Sci.), 4 (1933), No. 3, pp. 362–367; Eng. abs., p. 367*).—Experimental results showed that the pathogenicity of *H. sasakii* on rice seedlings differs greatly according to the quantity of salt added to the soil or to sand. The disease never occurred when salt was added at the rate of 1 percent or more, althought the influence of the salt is not yet clear.

Studies on the rot-disease of rice-seedlings caused by Pythium-species, S. ITO and Y. TOKUNAGA (*Jour. Faculty Agr., Hokkaido Imp. Univ., 32 (1933), No. 5, pp. 201–228, pls. 5*).—The rot disease of rice seeds and seedlings in nursery beds is one of the most serious diseases in Japan. Five species of *Pythium* were isolated from diseased plants collected in Hokkaido and Honshu: *P. oryzae* n.sp., *P. nagaii* n.sp., and *P. echinocarpum* n.sp (all described); *P. monospermum;* and an unidentified species. Detailed studies of the mycelial growth are reported, based on both laboratory experiments and field observations.

"As the results of inoculation experiments, all species of isolated fungi showed independently their pathogenicity to the rice plant. The infection was transmitted by the zoospores and creeping hyphae, and the infection percentages were very high under the conditions favorable to the formation of zoospores."

Physiologic specialization of Sphacelotheca cruenta (Kühn) Potter, L. E. MELCHERS (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 5, pp. 339–342*).—Physiologic forms of *S. cruenta*, found in Kansas Experiment Station studies and designated forms 1 and 2, could be separated on the basis of their pathogenicity to various sorghums. Certain feteritas, milo, hegari, Schrock, and Dwarf Shantung kaoliang are highly resistant to both forms. Form 1 attacks kafir × feterita and Pierce kaferita very readily, while form 2 does not infect them to any extent. Form 2, however, severely attacks Red Amber × feterita and White Yolo, which are immune from form 1. Tests of 35 varieties of sorghum during the period 1930–32 indicated that certain varieties of feterita and milo generally regarded as immune may be attacked by one or both forms of *S. cruenta*.

Belated development of kernel smut (Sphacelotheca sorghi) in apparently healthy sorghum plants, L. E. MELCHERS (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 5, pp. 343–350, fig. 1*).—Sorghum varietal plats used in earlier studies on the physiologic forms of kernel smut (E.S.R., 66, p. 839) served also for the material in the studies reported from the Kansas Experiment Station. Self-pollinated seed of the several sorghum varieties was heavily inoculated with chlamydospores of five physiologic forms of *S. sorghi* and planted at a time favorable for maximum infection.

Many sorghum plants among susceptible varieties do not develop kernel smut in the primary heads even though the plants have the mycelium of *S. sorghi* within their tissues. Cutting back infected plants not showing kernel smut in the primary heads was often followed by development of smut in the new growth of axillary shoots and in shoots developed from sucker buds. Highly resistant or immune varieties did not develop kernel smut in heads produced after the plants were mutilated, i.e., resistant varieties evidently do not carry smut hyphae in their tissues. The increase in kernel smut obtained by plant mutilation was directly proportional to the degree of susceptibility of the variety as expressed by primary head infection. Physiologic form 2 of *S. sorghi*, the milo form, not only attacked more varieties, including the usually resistant milo, hegari, and White Yolo, but also caused a higher percentage of kernel smut within a variety than the four other forms.

Some properties of the curly-top virus, H. H. P. SEVERIN and J. H. FREITAG (*Hilgardia* [*California Sta.*], *8 (1933), No. 1, pp. 48, figs. 3*).—Experiments in cooperation with the U.S. Department of Agriculture demonstrated that beet leafhopper nymphs, after feeding on filtered and unfiltered juices extracted from the blades, petioles, and blades and petioles combined, from beet seedlings experimentally infected with curly top in the greenhouse, failed to transmit the virus to healthy beets, oxidation possibly being a factor in the inactivation of the virus. Infections were obtained with juices extracted from the blades and beet roots of large diseased beets from the field, but not with juices extracted from the petioles or the blades and petioles combined. While the virus can be transmitted more readily by previously noninfective nymphs exposed to centrifuged and supercentrifuged beet-root juice than by those exposed to similarly treated leaf juice, marked differences in the results were not obtained with centrifuged and supercentrifuged beet-root juice. Extracts from diseased beet roots, diluted with various diluents and then centrifuged, gave better results than similar extracts from diseased leaves.

Inactivation of the virus occurred after extracted, centrifuged, and supercentrifuged diseased beet-root juice was exposed to the air at room temperature for 72 hours. The longevity of the virus in the filtrate prepared from diseased beet-root juice under aerobic conditions was 8 days. Infections were obtained with partially anaerobic filtrate prepared from supercentrifuged diseased beet-root juice at the end of 5 weeks. In filtrate prepared from diseased beet-root juice adjusted to pH 5.0 and 6.0 and kept in an anaerobic jar, the virus was recovered after 100 days, but with the same juice adjusted to pH 3.5, the virus was apparently inactivated when tested after 7 days. Attempts to cultivate curly-top virus in a feeding solution under anaerobic conditions failed. The virus was inactivated in the pulp of diseased beet roots dried in the greenhouse for periods of 5 and of 7 weeks and in the headhouse for 7 weeks, and in dried infective beet leafhoppers. It was also inactivated in beet-root juice diluted with centrifuged juice extracted from Alameda or Mammoth sweet-corn plants at rates of 1:50, 1:100, and 1:200, after 2, 4, and 6 hours. The thermal death point of the virus in beet-root juice and virus extract prepared from infective beet leafhoppers was 80° C. in 10-minute exposures. Freezing filtered beet-root juice kept cold storage at —8° did not inactivate the curly-top virus after 11 months 8 days.

Sedimentation of the virus evidently did not result from supercentrifuging beet-root juice three times. No increase occurred in the infections with the supercentrifuged liquid prepared from the gummy residue resuspended in distilled water, nor were infections obtained after the first day with filtrate containing a mixture of supercentrifuged liquid prepared from the gummy residue of aluminum gel. The tolerance to dilution of centrifuged diseased beet-root juice was 1:1,000, and that of virus extract from infective beet leafhoppers was 1:24,000.

A study of Phoma lingam (Tode) Desm., and of the " dry rot " it causes, particularly in swede turnips, W. Hughes (*Roy. Dublin Soc. Sci. Proc., n.ser., 20 (1933), No. 29–36, pp. 495–529, pls. 2, fig. 1*).—The symptoms and development of dry rot on swede seedlings, leaves, fleshy roots, siliques, and seeds are described.

Dry rot of swedes and turnips is caused by *Phoma lingam*. A number of fungi occur on diseased swede plants which are considered forms of this parasite, but the one which is exclusively associated with typical dry rot of the roots in Ireland and is predominant on other organs is identical with the American cabbage blackleg organism and with strain II A of *P. lingam* from New Zealand.

On other plants than swede (and possibly turnip), a different form of *P. lingam* (IIB) predominated, producing a disease less severe than the American blackleg. The practical absence of the latter from Ireland is attributed to prevailing environmental conditions. Strain II A consistently produced dry rot in swede roots in the field and in the laboratory. Strain II B, with one exception, failed to do so in the field, while producing an indistinguishable rot in nongrowing roots in the laboratory. In Ireland there is a close approach to the conditions to which strain II A is adapted in active parasitic life on swedes (and possibly turnips), and strain II B on cabbages and related plants.

P. lingam is present in the outer portion of the testas of infected seeds but does not occur in the embryos of viable seeds. Dry rot may originate from at least three sources, namely, (1) the seed, (2) the diseased roots of the previous year which survive in the soil, and (3) similar roots present in farmyard manure. A detailed description is given of the progress of dry rot originating from each of these sources, and the relative importance of the latter is discussed.

A total of 164,050 seeds belonging to 42 commercial lots of swede and turnip seed was examined, and 10 lots were found to be infected. The number of infected seeds was very small in every case, averaging 1 in 6,310 seeds. *P. lingam* was found to grow in sterilized potting soil, but not in unsterilized field soil. Dry rot develops extensively in storage pits, and the sources of infection are discussed. No well marked resistance to dry rot was found to occur in swedes.

Extensive field experiments extending over a period of three years showed that the amounts of infection usually present on the seed were not capable of producing outbreaks of dry rot as serious as those originating from contamination in soil or manure. In certain experiments charlock (*Sinapis arvensis*) occurred in association with severe attacks of dry rot, and the presence of *P. lingam* on these plants was discovered.

Injury to apple by petroleum-oil sprays, P. A. Young and H. E. Morris (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 7, pp. 505–522, figs. 2*).—A total of 25 kinds of lubricating oils whose sulfonatable residues in emulsions ranged from 0 to 41.2 percent and viscosities from 38 to 244 seconds were tested in spraying experiments at the Montana Experiment Station. In general, oil injuries on the leaves of the Hibernal apple were correlated with the percentage of sulfonatable residues, leading to the suggestion that the maximum percentage for safety should not exceed 15 percent and that oils of from 5 to 10 percent sulfonatability are preferable. The principal symptoms of injury were premature defoliation; large brown spots; epiphyllous purple spots; hypophyllous brown, purple, and silvery spots; and chlorotic, translucent spots. Drought-injured leaves were more severely affected than were vigorous ones.

Of three emulsifying agents, calcium caseinate, ammonia casein, and cresoap, the last proved most desirable on the basis of easier dilution, more uniform application, and lessened injury. In the experiments there was no apparent correlation between the degree of leaf injuries and differences in viscosities between 50 and 108 seconds. Temperature, through its influence on viscosity and chemical activity of the oils, was an important factor in injury. No evidence of cumulative injury was observed in the six years of the experiment.

Zinc sulfate promising new treatment for mottle leaf, J. C. Johnston (*Calif. Citrogr.*, *18* (*1933*), *No. 4, pp. 107, 116–118, figs. 5*).—This progress report indicates that mottle leaf as found in Tulare County, Calif., characterized by a progressive reduction in leaf size as well as a chlorotic appearance and die-back of twigs and branches, may be benefited by from 5 to 10 lb. of zinc sulfate per tree applied in fall or winter in a narrow band about 2 ft. from the tree trunk.

It is recommended that fertilization on treated trees be discontinued and rain allowed to carry the zinc sulfate into the soil. Such treatment results in vigorous growth, but the effects on production and fruit quality are as yet unknown.—(*Courtesy Biol. Abs.*)

Preliminary disinfection experiments against mould wastage in oranges, I. Reichert and F. Littauer (*Hadar, 4 (1933), Nos. 3, pp. 57–60; 4, pp. 92–94, figs. 2*).—Uninjured fruit when inoculated with green mold (*Penicillium digitatum*) remained healthy. Borax treatment of the fruit gave the best results. Soaking for five minutes in a 7 percent solution reduced blue and green mold wastage by 80 percent.

Control of mould wastage in oranges by careful handling, I. Reichert and E. Hellinger (*Hadar, 4 (1931), No. 5, pp. 115–117, figs. 3*).—These experiments indicated that, generally speaking, the intact epidermis of a sound fruit acts as an efficient barrier against the entry of such organisms as blue and green mold which are responsible for the rotting of the fruit, but that the slightest abrasion in the rind can admit the developing spores of these organisms into the inner tissues. It is therefore advised that pickers, graders, and packers wear gloves while handling the fruit.

A brown bark rot of cacao trunk, G. O. Ocfemia and M. S. Celino (*Philippine Agr., 21 (1933), No. 10, pp. 665–673, pl. 1, figs. 2*).—The causal organism (*Hypomyces haematococcus*) was isolated, and its pathogenicity was tested. Control measures are given.

Contribution to the pathology of Corylus sp.—I, Injury to branches caused by Cytospora, A. Trotter (*Contributi alla patologia del Nocciuolo.—I, Il seccume dei fusti da Cytospora.* In *Ricerche, osservazioni e divulgazioni fitopatologiche, per la Campania ed il Mezzogiorno,* II. *Portici* (*Napoli*)*: R. Lab. Patol. Veg., 1933, pp. 17–27, figs. 3*).—The author's experiments show that blight and breaking off of branches of *Corylus* ("disgelatura traumatica" of Savastano) can be identified with the "sol-cuit" of Catalogna. It is found that this blight, which does not proceed from the roots but attacks the branches, is caused by *Cytospora corylicola* and that its penetration and diffusion is favorably influenced by predisposing mechanical (wounds) and physical (burning) factors. It is therefore recommended that prophylactic measures be in the nature of protecting the tree from injury and removal of all branches showing a tendency to dry up from any cause.

The author recommends fall or winter painting with from 25 to 30 percent ferrous sulfate solutions acidified with from 1 to 10 percent H_2SO_4, or with from 3 to 4 percent Bordeaux paste, and protecting the branches successively by painting with 5 percent milk of lime and the larger wounded surfaces with any suitable mixture, such as tar or equal parts of red lead and cooked linseed oil.

Control of foliage diseases of pecans in Louisiana, J. R. Cole (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 58–60, 62*).—The author's experiments indicate that, with the exception of downy spot, the pecan foliage diseases now present in Louisiana and east Texas may be controlled commercially with one application of Bordeaux mixture. Where downy spot is present, it may become necessary to make a prepollination spray of 2–3–50 Bordeaux mixture followed about one month later with the summer strength (4–6–50). Where the grower is spraying for scab and two or more applications are to be made, the 3–4–50 Bordeaux mixture should give commercial control of the foliage diseases.

New developments in treating pecan rosette with chemicals, A. O. Alben, J. R. Cole, and R. D. Lewis (*Natl. Pecan Assoc. Proc., 31 (1933), pp. 71, 72*).—The authors review pertinent literature and their own work, and state that their experiments in spraying foliage with zinc sulfate or zinc lime sprays and also the experiments in dipping in zinc solutions terminals of branches showing pronounced rosette symptoms and the prompt and favorable response of the trees to such treatments apparently indicate that zinc is an essential element for the healthy development of the pecan tree.

case of heavily infected plants amounted to from one fourth to three fourths of the current year's needles. Reports received in 1928 indicated that no killing or permanent deformation of the infected trees had resulted.

Field and laboratory examinations of the uredinial stages of the causal organisms on heath plants indicated *Melampsoropsis cassandrae* to be very common, *M. abientina* to be fairly common, and *M. ledicola* to be of little significance. Inoculation studies on leatherleaf and Labrador tea tended to strengthen these conclusions as to the relative prevalence of the several fungi.

Effect of steam sterilization on susceptibility of wood to blue-staining and wood-destroying fungi, A. D. Chapman (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 6, pp. 369–374, fig. 1*).—That the customary practice of steam sterilizing blocks of wood prior to their inoculation with fungi may introduce undesirable variables was indicated in experiments conducted with three southern pines, namely, shortleaf, loblolly, and longleaf, where the blocks of wood under comparison were cut from the same piece of lumber. Employing two stain fungi, *Graphium rigidum* and *Ceratostomella pilifera*, complete coverage with mycelium was usually obtained in the culture chamber in from 4 to 5 days. A microscopic examination showed greater abundance of fungus hyphae both in the ray cells and wood tracheids of the steamed material.

Strength tests of the wood showed that the increased growth of fungi had weakened the wood decidedly, particularly with respect to the total work required in bending and its toughness. The modulus of rupture was only slightly affected. Steaming apparently reduced the variability of the fungus effect on blocks from the same log.

In a preliminary study with two decay fungi, *Poria incrassata* and *Lentinus lepideus*, steaming appeared to increase the loss in weight which the fungi were able to produce in the green sapwood of loblolly pine. In general conclusion the author points out that deductions drawn from inoculation experiments in which wood has been steam sterilized are subject to considerable error unless due allowance is made for the effects of such sterilization.

Lightning damage in rubber plantations, A. Sharples (*Jour. Rubber Res. Inst. Malaya, 5* (*1933*), *No. 1, pp. 22–28, pls. 2*).—Lightning was proved to be of importance in the causation of disease on rubber plantations. The typical effects on rubber plantations are described, and attention is especially directed to the association of claret-colored bark canker at the collar of trees slightly affected by lightning.

A note on manganese in Malayan soils, C. G. Akhurst (*Jour. Rubber Res. Inst. Malaya, 5* (*1933*), *No. 1, pp. 29–34*).—Analyses showing the manganese contents of a number of Malayan soils are recorded. In no case was manganese found in quantities sufficient to have detrimental effects on sheet rubber. Toxic effects of excessive amounts of manganese on rubber seedlings are described.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Officials and organizations concerned with wild-life protection, 1933, compiled by F. G. Grimes (*U.S. Dept. Agr., Misc. Pub. 166* (*1933*), *pp. 13*).—This is the thirty-third edition of this directory (E.S.R., 66, p. 49).

Game laws for the season 1933–34: A summary of Federal, State, and Provincial statutes, H. P. Sheldon and F. G. Grimes (*U.S. Dept. Agr., Farmers' Bul. 1717* (*1933*), *pp. II+41*).—This is the thirty-fourth annual summary of the Federal and other game laws and regulations (E. S. R., 68, p. 350).

New England Game Conference (*Cambridge, Mass.: Samuel Marcus Press,* [*1933*], *pp. 94, figs. 8*).—Following brief introductory remarks by the chairman,

H. F. Schnurle, the contributions presented at the Fifth Annual New England Game Conference, held under the auspices of the Massachusetts Fish and Game Association at Boston on February 11, 1933, include the following: Waterfowl Problems Revealed by Banding Operations, by F. C. Lincoln (pp. 10–30); The Federal Migratory Bird Advisory Board, by G. J. Stobie (pp. 31, 32); The New York Ruffed Grouse Investigation and Its Propagation Work, by G. Bump (pp. 33–50); How Research and Game Surveys Help the Sportsman and Farmer, by A. Leopold (pp. 51-56); Some Adventures in Bird Protection, by T. G. Pearson (pp. 57–61); The Fallacy of Mental Sanctuaries, by T. H. Beck (pp. 61–64); The Business Angle of Fish and Game Restoration, by R. J. Kenney (pp. 65–70); the Sportsman's Problem as the Landowner Sees It, by E. Poole (pp. 70–72); Experiments in Restoring Quails in Essex County, Massachusetts, by J. C. Phillips (pp. 72–77); What Has Been Accomplished in New Jersey under the "Semi-Wild Breeding Law", by A. F. Foran (pp. 77–82); Some Informal Remarks about Hunting and Fishing in Rhode Island, by E. L. Barrus (pp. 83–86); The Present Day Sportsman's Club, by A. H. Brown (pp. 86–89); and The Biological Angle of Fish and Game Restoration, by S. Deake (pp. 89-94).

A decade of bird banding in America: A review, F. C. LINCOLN (*Smithsn. Inst. Ann. Rpt., 1932, pp. 327–351, pls. 5, figs. 3*).—A digest of banding work, presented in connection with a list of 21 references to the literature.

The nesting and the life equation of the Wisconsin bob-white, P. L. ERRINGTON (*Wilson Bul., 45 (1933), No. 3, pp. 122–132*).—This is a report of observations made of the quail in Wisconsin in connection with the wintering work previously noted (E.S.R., 69, p. 824).

The author has found that in a great many respects the Georgia life history findings of Stoddard (E.S.R., 65, p. 544) hold good for northern as well as for southern quail. It appears, however, that the North has its own problems and its own factors of shifting values.

The eggs of Japanese birds, I–V, K. KOBAYASHI and T. ISHIZAWA (*Rokko, Kobe, Japan: Keisuke Kobayashi, 1932, pts. 1, pp. [1]+10, pls. 9; 2, pp. [1]+11–17, pls. 10; 3, pp. [1]+19–35, pls. 8; 1933, pts. 4, pp. [1]+37–52, pls. 8; 5, pp. [3]+53–65, pls. 6, fig. 1*).—The eggs of Japanese birds are illustrated by plates, of which 28 are colored, and accompanied by descriptive accounts. In the fifth part of this work the director, S. Uchida, announces the death of K. Kobayashi II and that the work will be continued by his son, K. Kobayashi III.

Some parasites of Oregon wild life, J. N. SHAW (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 5, pp. 599–603, figs. 2*).—The information here presented is based upon the results of cooperative work conducted by the Oregon State Game Commission and the Oregon Experiment Station. A brief account of the findings in the fish and mammals examined is followed by a report upon the parasites found in 200 fish from 22 different sources. The single deer examined during the year was found parasitized by *Cysticercus tenuicollis*, the cystic form of *Taenia marginata*. It is pointed out that a large percentage of the parasites found in deer in Oregon are also found in sheep, and that in some counties of the State common pastures are used.

Parasites of porcupines of the genus Erethizon (Rodentia), W. L. JELLISON (*Amer. Micros. Soc. Trans., 52 (1933), No. 1, pp. 42–47*).—In this contribution from the Minnesota Experiment Station, a review of the literature and collection records by the author of parasites of the porcupine (*Erethizon* spp.) are presented in connection with a list of 22 references to the literature.

On some nematodes of the superfamily Rhabditoidea and their status as parasites of reptiles and amphibians, B. G. CHITWOOD (*Jour. Wash. Acad.

Sci., 23 (1933), No. 11, pp. 508–520, figs. 20).—In this contribution, which is presented in connection with a list of 13 references to the literature, a family is formed (Cylindrogasteridae), two genera are erected (*Goodeyus* and *Longibucca*), and two species are described as new (*Angiostoma plethodontis* and *L. vivipara*).

The interchange of soil and subsoil by burrowing insects, H. R. Bryson (*Jour. Kans. Ent. Soc., 4 (1931), No. 1, pp. 17–24*).—The results obtained in studies at the Kansas Experiment Station here reported show that insects play no small part in intermixing the soil when the various layers are fixed in their positions.

[Contributions on economic insects in Idaho] (*Idaho State Hort. Assoc. Proc., 37 (1932), pp. 18–21, 43–47, 49–56*).—The contributions here presented include the following: Results of Community Action in Codling Moth and San Jose Scale Control, by W. H. Wicks (pp. 18–21); San Jose Scale Control by Lime-Sulphur and Oil Emulsion Sprays, by C. Wakeland (pp. 43–47, 49–54); and The Destructive Prune Worm *Mineola scitulella* Hulst., by R. W. Haegele (pp. 54–56).

Entomology in Kansas: A historical note, R. J. Barnett (*Jour. Kans. Ent. Soc., 2 (1929), No. 4, pp. 90–93*).—This is a brief contribution from the Kansas Experiment Station.

[Contributions on economic insects in Ohio] (*Ohio State Hort. Soc. Proc., 66 (1933), pp. 23–54, 152–161, figs. 6*).—The contributions presented at the annual meeting of the society held at Columbus from January 30 to February 2, 1933 (E.S.R., 67, p. 424), include the following: Success and Failure in Spraying for Scab and Codling Moth, by G. Ricks (pp. 23–43); Combating Codling Moth, by F. Farnsworth (pp. 43–48); Some Notes on Codling Moth Behavior and Control, by T. H. Parks (pp. 49–54); and The Status of Native and Introduced Parasites of the Oriental Fruit Moth in Ohio, by R. B. Neiswander and M. A. Vogel (pp. 152–161).

[Report of work in economic entomology at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 293 (1933), pp. 21–23, fig. 1*).—The work of the year with economic insects (E.S.R., 68, p. 497) is reported under the headings of millipedes (*Scutigerella immaculata* Newp.) in greenhouses, wireworms (*Pheletes agonus*), and insects attacking mushrooms, all by C. A. Thomas, and control of codling moth, by H. N. Worthley.

Notes on insect pollinators in Nova Scotia orchards, C. B. Gooderham (*Sci. Agr., 13 (1933), No. 11, p. 730*).—The brief notes presented are considered to emphasize the insufficiency of a five-year period in studying the complete cycle of insect pollinators.

An economic entomology of the West Indies, G. N. Wolcott (*San Juan: Ent. Soc. Puerto Rico, 1933, pp. XVIII+688, figs. 111*).—Following general considerations (pp. 1–100), this practical account deals with pests of economic grasses (pp. 101–263), fiber crops (pp. 264–310), trees (pp. 311–377), fruits (pp. 378–524), and garden crops (pp. 525–662).

[Report of entomological work at Gezira, 1931–32], J. W. Cowland (*Sudan Govt., Gezira Agr. Res. Serv., Ann. Rpt., 1932, pp. 93–112, pl. 1*).—This report deals with a general survey made of insect pests in the Gezira in 1931–32, experimental work on cotton white fly (*Bemisia gossypiperda* M. & L.) and leaf curl disease, which it has been found to transmit to cotton seedlings, cotton bollworms (the pink bollworm and *Earias insulana*), cotton thrips (*Hercothrips* spp.), cotton bud thrips (*Frankliniella* spp.), and the durra stem borer *Sesamia cretica*. The details of the work are reported in tabular form.

In an appendix to the report (pp. 111, 112) notes are given on important points in a paper by R. S. Bagnall and W. P. L. Cameron on two species of *Hercothrips* (*H. fumipennis* of Bagnall and Cameron and *H. sudanensis* Bagn. and Cameron) injurious to cotton in the Sudan and an allied species (*H. graminicola* Bagn. and Cameron) on grass.

Insects affecting vegetable crops in Connecticut, R. B. FRIEND (*Conn. Veg. Growers' Assoc. Rpt., 1931, pp. 25–33*).—This is a practical discussion contributed from the Connecticut [New Haven] Experiment Station.

Principal insects injuring vegetable crops in [Connecticut in] 1931, W. E. BRITTON (*Conn. Veg. Growers' Assoc. Rpt., 1931, pp. 48–50*).—A brief discussion of the more important insect pests of vegetable crops in Connecticut in 1931.

Controlling vegetable insects, R. B. FRIEND (*Conn. Veg. Growers' Assoc. Rpt., 1932, pp. 66–72*).—This is a practical account contributed from the Connecticut [New Haven] Experiment Station.

A contribution toward the knowledge of the insects feeding on potato [trans. title], S. KÉLER (*Prace Wydz. Chorób Roślin Państ. Inst. Nauk. Gosp. Wiejsk. Bydgoszczy, No. 13 (1933), pp. 137–139*).—The insect enemies of potato in Poland here noted include 2 species of thrips; 7 species of Heteroptera; and 11 species of Homoptera, of which 4 are aphids, 5 cicadids, and 2 psyllids.

Insect pests of sugar cane (*Internatl. Soc. Sugar Cane Technol. Cong. [San Juan] Proc., 4 (1932), pp. [121], figs. 17*).—The contributions on biological control of sugarcane insects presented at the Fourth Congress of the International Society of Sugar Cane Technologists, held in San Juan, P.R., in March 1932, include the following: The Food Habits of the Imported Toad *Bufo marinus* in the Sugar Cane Sections of Porto Rico, by R. R. Dexter (Bul. 74, pp. 6); Investigations on the White Top-Borer [*Scirpophaga auriflua intacta*] by E. H. Hazelhoff, with a summary by P. C. Hart (Bul. 66, pp. 8); Sugarcane Borer Control by Field Colonization of *Trichogramma minutum* in Louisiana, by W. E. Hinds and B. A. Osterberger (Bul. 52, pp 6); An account of Some Scoliid Wasps Parasitic on Sugar-Cane Grubs in Occidental Negros, Philippine Islands (pp. 1–6, 9–12) and Progress Report on the Exchange of Scoliid Wasps with Australia (pp. 6–9), by A. W. López (Bul. 50, pp. 12); Ecological Research on Insect Pests of Sugar-Cane in the British West Indies and British Guiana, by J. G. Myers (Bul. 22, pp. 3); Recent Introductions of Insects Beneficial to the Sugar Cane Industry of Hawaii (Bul. 3, pp. 2) and Insect Damage to Sugar Cane Roots in Hawaii (Bul. 4, p. 1), both by C. E. Pemberton; and The Status of *Trichogramma* [*minutum*] as a Control of *Diatraea saccharalis* in Barbados, by R. W. E. Tucker (Bul. 102, pp. 6).

The contributions relating to the sugarcane moth borer are as follows: Studies on Early Larval Mortality of *Diatraea saccharalis* in Antigua, with Special Reference to Natural Parasitism of Eggs by *Trichogramma*, by H. E. Box (Bul. 122, Sup., pp. 6); Methods of Studying the Abundance of *Diatraea saccharalis* in Louisiana, by W. E. Hinds (Bul. 114, pp. 5); Observations on Some Factors Which May Affect the Abundance of *Diatraea saccharalis* in Porto Rico, by M. D. Leonard and F. Seín, Jr. (Bul. 92, pp .2); The Seasonal Development of *Diatraea saccharalis* Fabr. and Its Principal Parasites in Cuba, by H. K. Plank (Bul. 113, pp. 8); and The Influence of Extreme Climatic Conditions in Peru on Moth-Borer Abundance (Bul. 87, pp. 3) and On Methods of Determining Borer Abundance in Cane Fields (Bul. 88, pp. 2), both by G. N. Wolcott.

The survey problems considered include A Suggestion for the Development of a Manual of Sugarcane Insects of the World, by W. E. Hinds (Bul. 21, pp. 4). and A Revised List of the Insects Affecting Sugar-Cane in Cuba, by D. L. Van Dine and L. D. Christenson (Bul. 116, pp. 3) (E.S.R., 56, p. 756).

The diseases and insect pests of sugarcane considered in the joint session include a Report of Committee on Protective Sugar Cane Quarantine, by E. W. Brandes (Bul. 126, pp. 9); Minute Soil Inhabiting Animals Injuring Sugar Cane in Louisiana, by J. W. Ingram (Bul. 85, pp. 3); A Report on the Corn Aphis (*Aphis maidis* Fitch) in Cuba, by U. C. Loftin and L. D. Christenson (Bul. 115, pp. 20); Artificial Transmission and Other Studies on Sugar-Cane Mosaic (Bul. 84, pp. 6) and Soil Animals and Root Disease in Porto Rico (Bul. 91, pp. 2), both by F. Sein, Jr.; and The Nematodes Attacking Sugar Cane Roots in Hawaii, by R. H. Van Zwaluwenburg (Bul. 5, pp. 4).

Important leaf feeding and gall making insects infesting Michigan's deciduous trees and shrubs, E. I. McDaniel (*Michigan Sta. Spec. Bul. 243 (1933), pp. 70, figs. 77*).—This practical account deals with the leaf-feeding and gall-making insects that have been the subject of inquiries received by the station during the last 20 years. It is pointed out that no attempt has been made to include a complete list of such insects, but that certain representative types have been selected. The account has been prepared with a view to furnishing information particularly to nurserymen, city foresters, and landscape gardeners, as well as others interested in the control of insects destructive to shade trees.

Orchard insects of the Pacific Northwest and their control, E. J. Newcomer (*U.S. Dept. Agr. Circ. 270 (1933), pp. 77, figs. 83*).—This is a practical summary of information relating to apple and pear insects (pp. 2–44), cherry insects (pp. 44–49), prune and plum insects (pp. 49–59), peach insects (pp. 59–63), and walnut insects (p. 63). An account of the economic insects is followed by notes on beneficial insects, spray materials, spraying schedules, dusting materials, tree-banding materials, baits and lights, and orchard methods and sanitation.

[The principal insect enemies of tea and coffee in the Far East], R. du Pasquier (*Bul. Écon. Indochine, Sect. B, 35 (1932), May–June, pp. 225–253, pls. 5, figs. 17; July–Aug., pp. 367–415, pls. 6, figs. 19; Sept.–Oct., pp. 589–618, pls. 3, figs. 5; Nov.–Dec., pp. 689–720, pls. 5, figs. 11*).—The first contribution deals with some of the more important coleopterous enemies of tea and coffee, together with their natural enemies, particularly the hymenopterous parasites; the second contribution with forms of Lepidoptera; the third contribution with forms of Diptera, Hymenoptera, Orthoptera, Isoptera, Heteroptera, and Homoptera (in part); and the fourth with Homoptera (in part), Thysanoptera, Acarina, and Nematoda. The work, which relates particularly to French Indochina, includes colored plates which illustrate the life and work of many of the forms.

The part dealing with plant diseases has been noted (E.S.R., 69, p. 822).

Entomological investigations on the spike disease of sandal (Santalum album Linn.), I–XI (*Indian Forest Rec., 17 (1932), No. 1, pp. 53, figs. 8; 17 (1933), Nos. 9, pp. 12, fig. 1; 10, pp. 10, pl. 1; 18 (1933), Nos. 1, pp. 4; 2, pp. 4; 3, pp. 8; 4, pp. 5; 5, pp. 21, pls. 3; 6, pp. 4; 7, pp. 16; 8, pp. 26, pls. 2*).—The first part of this report of studies of the insect fauna of sandal is an introductory survey of the problem, by C. Dover. Part 2 deals with the Bostrichidae, Platypodidae, and Scolytidae (Coleoptera), by C. F. C. Beeson; part 3 with the Membracidae (Homoptera), by W. D. Funkhouser; part 4 with the Cercopidae (Homoptera), by V. Lallemand; part 5 with the Brenthidae and Lycidae (Coleoptera), by R. Kleine; part 6 with the Anthribidae (Coleoptera), by K. Jordan; part 7 with the genus *Exocentrus*, Cerambycidae (Coleoptera), by

W. S. Fisher; part 8 with the Carabidae (Coleoptera), by H. E. Andrewes; part 9 with the Neuroptera, by N. Banks; part 10 with the Melasidae and Elateridae (Coleoptera), by E. Fleutiaux; and part 11 with the Fulgoridae (Homoptera), by N. C. Chatterjee.

Insect enemies of insects and their relation to agriculture, C. P. Clausen (*Smithsn. Inst. Ann. Rpt., 1932, pp. 353–362*).—This is a brief practical account.

Fungous and bacterial diseases in the control of grasshoppers and chinch bugs, R. C. Smith (*Kans. State Bd. Agr., Bien. Rpt., 28 (1931–32), pp. 44–61, figs. 7*).—This is a summary of information contributed from the Kansas Experiment Station and presented in connection with a list of 27 references.

Hydrocyanic penetration gas in 140 pound bags of flour under atmospheric conditions, G. Schenk and G. A. Dean (*Jour. Kans. Ent. Soc., 2 (1929), No. 3, pp. 60–66*).—The work reported here has shown that "flour in 140-lb. bags can be successfully penetrated by hydrocyanic acid gas under the following conditions: (1) In a metal lined vault; (2) when the bags are separated to allow the gas to surround each bag; (3) when sufficient hydrocyanic acid gas is applied to maintain a lethal concentration after the product fumigated has adsorbed its quota of gas at the prevailing concentration and temperature; [and] (4) long exposure, 20 hours, is more economical than increasing the dosage for a shorter exposure. Since the amount of gas adsorbed is inversely proportional to the temperature, increased temperatures should permit either of the following: (1) The dosage reduced [or] (2) the exposure shortened."

Notes on the occurrence of rotenone in species of Derris and Lonchocarpus, H. A. Jones (*Jour. Wash. Acad. Sci., 23 (1933), No. 11, pp. 493–496*).—The results obtained in the studies here reported indicate that the stems and leaves of derris and cubé are of no value as commercial sources of rotenone. Fine cubé roots were found to contain a higher proportion of rotenone than the coarse roots, and the outer portion of the root to have a higher rotenone content than the inner part. It is pointed out that the roots of species of *Lonchocarpus* in addition to *L. nicou* should be investigated as possible sources of rotenone.

Volck Oil, Special Emulsion Number Two, as an animal insecticide, D. G. Hall (*Jour. Kans. Ent. Soc., 2 (1929), No. 4, pp. 74–82*).—The work reported has led the author to conclude that "Volck Oil, Special Emulsion No. 2, in proper dilution is effective in a single application when in contact with those external insect parasites which have no egg stage upon the host. Two applications of Volck oil in proper dilution is necessary to control those external insect parasites of animals when these have an egg stage upon the host. The oil is not effective as an ovicide in dilutions of 12 percent and less. The oil is harmless to animals when used externally, and is harmless to animals when used internally in doses such as the animal would be subjected [to] in ordinary dipping and spraying. When used as a hair dressing, Volck oil acts favorably upon the skin and hair of animals."

The Thysanoptera of South America, I–III, D. Moulton (*Rev. Ent., 2 (1932), No. 4, pp. 451–484, figs. 3; 3 (1933), Nos. 1, pp. 96–133, figs. 14; 2, pp. 227–262, fig. 1*).—This paper lists all the Thysanoptera known to occur in South America. Two genera are erected (*Exophthalmothrips* and *Diploacanthothrips*), and many new forms are characterized. Keys for their separation are included.

The harlequin bug and its control, W. H. White and L. W. Brannon (*U.S. Dept. Agr., Farmers' Bul. 1712 (1933), pp. II+10, figs. 6*).—This publication, prepared in cooperation with the Virginia Truck Experiment Station, supersedes Farmers' Bulletin 1061, previously noted (E.S.R., 42, p. 852).

The chinch bug as a rice pest, D. Isely and W. R. Horsfall (*Jour. Kans. Ent. Soc., 4 (1931), No. 3, pp. 70–73*).—The damage of the chinch bug to rice in Arkansas occurs only when rice fields are not flooded, that is, early in the season and late in the season after drainage preparatory for harvest. In heavily infested spots the chinch bug frequently destroys the entire stand of rice, but the area of such spots is seldom greater than a few acres. In young rice the leaf blades were observed to turn yellow or brown and shrivel. Injury to rice in the head was also observed in the late summer of 1930 after water was removed, resulting in little or no grain developing.

The nature of the sheath material in the feeding punctures produced by the potato leaf hopper and the three-cornered alfalfa hopper, F. F. Smith (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 7, pp. 475–485*).—The author reports a study of the chemical nature of the sheaths found in feeding punctures produced by the potato leafhopper and the three-cornered alfalfa hopper, *Stictocephala festina* (Say). Tests were made for materials that might be derived from the surrounding plant cells and for materials that might be produced by the insects. The results obtained are compared with those of previous workers as recorded in the literature, a list of 24 references to which is included.

"In all tests, the sheaths made by the two species responded similarly. All tests for plant-reserve, wound-response, and plant-cell-wall substances except the color tests for pectin compounds were negative. Color tests for mucin were negative, but certain color tests for proteins and amino acids showed that the sheath material is largely proteinaceous. The sheath material may contain chitin, as it responded similarly to chitinous exoskeleton in a number of tests. In the course of this study four tests were found which differentiate sheath material from plant tissue by color, namely, Adamkiewicz, Sakaguchi, quinone solution, and Benedict's modification of the Hopkins-Cole reaction. It appears that the sheath is largely of insect origin and contains no plant substance, with the possible exception of pectose. The highly insoluble sheath, persisting in the vascular tissue, probably interferes with the normal translocation of plant materials and accounts for the typical plant injuries caused by the feeding of *Empoasca fabae* and *S. festina*."

Leafhoppers and the trap light, P. B. Lawson (*Jour. Kans. Ent. Soc., 2 (1929), No. 2, pp. 39–47, fig. 1*).—This is a report upon the results obtained from trap-light collections at Lawrence, Kans., made during the season of 1928. A total of 70,966 individuals, representing 126 species and varieties, were collected. A list is given of the species taken during the season. It appears that *Draeculacephala mollipes* comprised 41 percent of the season's catch, *Euscelis obscurinervis* 23, *Deltocephalus inimicus* 11, and *Phlepsius irroratus* 9 percent.

Another season's trap-lighting of leafhoppers, P. B. Lawson (*Jour. Kans. Ent. Soc., 3 (1930), No. 2, pp. 35–43*).—In continuation of the work above noted, collections made at a trap light are reported upon, including a list of the species taken during the season and a table of the season's catch, by species, which included 288,635 individuals. Among the information gained from the work is knowledge of the species most abundant, frequency, conditions under which swarming occurs, species involved, species which hibernate as adults and as nymphs, etc.

Two Erythroneura (grape leaf hoppers) damaging apple in Kansas (Homoptera, Cicadellidae), R. H. Beamer (*Jour. Kans. Ent. Soc., 3 (1930), No. 2, pp. 49, 50*).—Two forms that were found attacking apple leaves near Ottawa, Kans., in September 1929 and here noted are *E. lawsoniana* Bak. and *E. omani* n.sp.

Synopsis of the family Cercopidae (Homoptera) in North America, K. C. DOERING (*Jour. Kans. Ent. Soc., 3 (1930), Nos. 3, pp. 53–64; 4, pp. 81–108, pls. 6*).—This synopsis of the Cercopidae includes keys to the subfamilies, genera, and species and varieties.

The spray value of nicotine supplements for aphids, H. C. HUCKETT (*New York State Sta. Tech. Bul. 210 (1933), pp. 20, figs. 6*).—In spraying tests with a nicotine sulfate spray mixture against aphids with a view to determining the value of certain so-called spray supplements or nicotine activators, the supplements used included three proprietary soaps, a powdered gum, and four miscible oils—three mineral and one vegetable.

These supplements, with the exception of the gum, invariably enhanced the effectiveness of nicotine sulfate and water sprays, but not to such a degree as to eliminate the necessity for a relatively high dosage of nicotine sulfate to produce a high rate of mortality among aphids. The effectiveness of such sprays was perceptibly reduced when only one quarter of the normal amount of nicotine sulfate was added to the spray mixture. At one half the normal nicotine sulfate dosage such sprays showed a wide degree of variation in effectiveness as compared with the more consistent, higher kills obtained with full nicotine dosage. The most promising results at half nicotine sulfate dosage in such sprays was obtained by the use of soaps and miscible mineral oil supplements in tests on the melon and potato aphids.

"With Bordeaux mixture and nicotine sulfate sprays, the advantage gained in spray efficiency by the addition of spray supplements was not so consistently shown with all species of aphids as in the case of aqueous sprays. In tests with melon and potato aphids, Bordeaux mixture and nicotine sulfate sprays produced results as satisfactory as those obtained with such sprays containing supplements. On the other hand, in tests with green peach and cabbage aphids the addition of supplements increased the effectiveness of such sprays, but only to such a degree in occasional instances as to preclude the necessity for the full dosage of nicotine. Such instances occurred with the use of half the nicotine sulfate dosage in Bordeaux mixture and mineral oil sprays in tests on the green peach aphid, and with a similar nicotine sulfate dosage in Bordeaux mixture and Penetrol sprays in tests on the cabbage aphid."

The spruce gall aphid as a forest pest, R. B. FRIEND and B. H. WILFORD (*Jour. Forestry, 31 (1933), No. 7, pp. 816–825*).—This joint contribution from the Yale University and the Connecticut [New Haven] Experiment Station on *Adelges abietis* L. deals with an insect which has been regarded as a serious pest of forest plantations in the eastern half of the country. The authors' studies in Connecticut, however, have led them to conclude that the injury caused by the pest does not constitute an economic obstacle to the planting of Norway spruce. It has been found that about one fourth of the trees will become seriously injured, but that this will not materially affect the production of timber. Moreover, these trees are predominantly those of slow growth which would normally become suppressed. This has also been found to be true of white spruce in the few cases investigated. When Norway spruce trees are planted on a good site, they will in most cases outgrow the effects of the injury, even though not immune, and after the plantation closes the tops of the crowns will remain practically free of galls, the longitudinal growth of the tree not being visibly impaired. The immunity of individual trees appears to be due to the inability of hibernating females to survive and oviposit on them. All gradations of such immunity occur.

A list is given of 10 references to the literature.

Transmission of the crinkle disease of strawberry, E. K. VAUGHAN (*Phytopathology, 23 (1933), No. 9, pp. 738–740, fig. 1*).—Experiments conducted at the Oregon Experiment Station indicate that crinkle disease of strawberry is caused by a virus which may be transmitted by the strawberry aphid. "The infective principle does not pass from the adult aphids to the first instars. The disease can be transmitted by aphids from the Ettersburg No. 121 to the Marshall variety. Some plants may recover after the first shock of inoculation. No infection was obtained by such mechanical inoculations as graftage, by leaf mutilation, or by the use of extracts from diseased leaves."

Beech disease in Maine forests follows in wake of scale insect (*Jour. Forestry, 31 (1933), No. 7, pp. 847, 848*).—The beech scale is said to have been found apparently to precede outbreaks of the *Nectria* fungus disease, which has destroyed approximately a third of the beech trees of Nova Scotia and many of the beeches of southern New Brunswick and to have appeared in Maine. The beech scale has also been found in Massachusetts. A tree is destroyed by the fungus within a year or two after it is attacked. The insect appears as a white cottony fluff on the bark, and later the fungus appears as small red spots on the bark.

"There is a close association between the presence of the beech scale and the appearance of the fungus, and it is probable that the puncturing of the bark by the insect provides the opening through which the disease attacks the tree. It is possible that the fungus causing the disease is native to America, but that it could not damage the trees until the insects attacked the trees and opened the way for them. It is more probable that the fungus is an introduced European strain or species."

Lac in Malaya, I, N. C. E. MILLER (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 11 (1933), pp. [2]+24, pls. 3*).—This first part deals with observations on a lac insect, *Laccifer javanus* Chamb., and an account of attempts to propagate it.

Studies on the ecology and epidemiology of the cabbage butterfly.—II. On the bionomics of Pieris brassicae L. and its parasite Microgaster glomeratus L. [trans. title], H. Z. KLEIN (*Ztschr. Wiss. Insektenbiol., 26 (1932), No. 7–10, pp. 192–199*).—This report of studies conducted in Palestine is in continuation of the work previously noted (E.S.R., 69, p. 233).

The oriental moth (Cnidocampa flavescens Walk.) and its control, C. W. COLLINS (*U.S. Dept. Agr. Circ. 277 (1933), pp. 8, figs. 8*).—This circular presents information on the insect, an earlier account of which has been noted (E.S.R., 69, p. 78).

As regards natural control it is stated that "as a result of liberating in 1929 and 1930, approximately 85,000 adults of *Chaetexorista javana* B. B., a tachnid parasite from Japan, this parasite has become firmly established and is exerting much influence toward control, as evidenced by a gain in average parasitization from 0.78 percent in 1930 to 52.43 percent in 1932–33. This control was further observed in a decided decrease in the number of host cocoons present during the latter year. The oriental moth can also be controlled in the early larval instars (August 1–15) by spraying with lead arsenate at the rate of 3 lb. to 100 gal. of water with the addition of fish oil or linseed oil, as an adhesive, in the proportion of 4 oz., or 0.25 pt., to each pound of lead arsenate used. After August 15, when the larvae are one half or more grown, an additional pound of poison should be added with a proportional increase of sticker."

The efficiency of certain proprietary oil emulsions, Volck and Orthol-K, for control of the oriental fruit moth, D. MACCREARY (*Delaware Sta. Bul. 184 (1933), pp. 43, figs. 26*).—Following a brief introduction and description of the oil emulsions Volck and Orthol-K, the author reports upon laboratory tests (pp. 6–30) and orchard spraying experiments (pp. 30–42).

The laboratory tests showed that oil-sprayed foliage tends to inhibit oviposition by the oriental fruit moth. "With thorough coverage, summer oil (either Volck or Orthol-K) at any concentration above 0.5 percent, alone or in combination with other insecticides, kills at least 70 percent of the eggs of the oriental fruit moth. With certain combinations (oil and hydrated lime; oil, hydrated lime, and lead arsenate; oil, Cal-Mo-Sul and Dutox; oil and nicotine tannate; and oil and nicotine sulfate) practically all of the eggs are killed.

"Summer oil on peach, at a concentration of 2 percent, combined with from 16 to 30 lb. of hydrated lime, 3 lb. of arsenate of lead, and 1 pt. of nicotine sulfate 40 percent per 100 gal. of spray, proved to be the most effective larvicide used. Even with a reduction of the hydrated lime to or below 16 lb. and eliminating the arsenical, the efficiency exceeded 80 percent. Summer oil on apple at a concentration of 1 percent, combined with from 25 to 30 lb. of hydrated lime, 3 lb. of arsenate of lead, 1 pt. of nicotine sulfate 40 percent per 100 gal. of spray, or with the arsenical eliminated, proved most effective as a larvicide.

"High concentrations of oil with a small amount of hydrated lime cause less lime to be deposited on sprayed fruit than do low concentrations of oil with the same amount of hydrated lime. Hydrated lime at the rate of 12 lb. or less per 100 gal. of spray and combined with oil at a concentration of 2 percent appears visibly on the fruit as a finely dispersed residue. Using more than this amount of hydrated lime with oil at the concentration mentioned produces a characteristic flaky deposit. It would seem, therefore, that hydrated lime may lose some of its mechanical value as an ovicide and larvicide when used in amounts smaller than 12 lb. per 100 gal. of spray with a high concentration of oil."

In the orchard spraying experiments no fungicides were incorporated with oil sprays. It was found that both Volck and Orthol-K are incompatible with sulfur fungicides and should not be combined with them or applied immediately preceding or subsequent to their use. An interval of from 2 to 3 weeks is usually sufficient to avoid the possibility of injury.

"In all cases where summer oil was employed on peach a considerable reduction in twig injury by the oriental fruit moth was effected. A corresponding decrease in fruit injury did not always follow, probably for two reasons, migration of moths from adjoining sections of the same orchard or from surrounding orchards and insufficient protection immediately preceding harvest.

"A combination of summer oil at a concentration of 2 percent, hydrated lime (decreasing from 32 to 4 lb. in successive applications), and 1 pt. of nicotine sulfate 40 percent per 100 gal. of spray is apparently the most effective spray for reducing peach infestation. The results. as a whole, indicate that major emphasis should be directed toward the control of the twig-inhabiting first- and second-brood larvae of this insect by heavy applications of hydrated lime and toward that of the fruit-infesting third- and fourth-brood larvae by mid- and late-summer oil sprays, with reduced lime.

"A combination of summer oil at a concentration of 1 percent, 30 lb. of hydrated lime, and 3 lb. of lead arsenate per 100 gal. of spray is apparently more effective than lead arsenate alone in reducing late-summer infestation of apple. Arsenical analyses of fruit at harvest indicate that late-summer applications of oil on apple tend to 'fix' the previous arsenical residue, and that the presence of hydrated lime in such a spray facilitates removal of this residue. No oil injury, either on foliage or fruit, was observed resulting from the application of Orthol-K at a concentration of 2 percent on peach and 1 percent on apple."

Are we developing strains of codling moths resistant to arsenic? L. Haseman and R. L. Meffert (*Missouri Sta. Res. Bul. 202 (1933), pp. 11, fig. 1*).—The experiments here reported, the details of which are presented in tabular form, were carried on with larvae collected in central Missouri, Fort Collins, Colo., and Blacksburg, Va.

"A dosage of 0.00000275 g of sodium arsenite when injected into the hemocoele of full-grown codling moth larvae gives a kill of from 85 to 90 percent within 4 hours. A dosage of 0.00000425 g sodium arsenite when injected through the mouth into the digestive tract of full-grown codling moth larvae gives a kill of from 75 to 80 percent within 4 hours. Sodium arsenite is a little more than 1.5 times as toxic when injected into the hemocoele than when introduced into the alimentary canal. A dosage of 0.00024 g acid arsenate of lead when introduced through the mouth into the alimentary canal gives a kill of from 26 to 33 percent in 4 hours and from 63 to 73 percent in 8 hours. Sodium arsenite when injected into the alimentary canal is about 113 times as toxic to full-grown codling moth larvae as is acid arsenate of lead, and it kills in one half the time.

"The sublethal dosage of 0.00000375 g of sodium arsenite when injected into the alimentary canal gives approximately the same percentage of kill of the Colorado, Missouri, and Virginia strains of full-grown codling moth larvae. The Colorado larvae show no greater resistance to total water-soluble sodium arsenite than do the Missouri and Virginia larvae. When injected through the mouth into the alimentary canal, the sublethal dosage of 0.00024 g of acid arsenate of lead gives approximately the same percentage of kill of the Colorado, Missouri, and Virginia strains of full-grown codling moth larvae. The fact, therefore, that it is more difficult to control the Colorado strain of codling moth larvae with arsenical sprays than is the case with Missouri and Virginia larvae is evidently not due to their having developed a resistance to arsenic."

A list is given of 15 references to the literature.

The smartweed borer (Pyrausta ainsliei Heinrich, Lepidoptera) in Kansas, R. Schopp (*Jour. Kans. Ent. Soc., 4 (1931), No. 2, pp. 25–38*).—The author's study of the smartweed borer shows that "eggs appeared in the field by June 2, and that the duration of the egg stage varied from 5 to 14 days. Eggs collected in the field hatched June 8. On July 1, the first larva from the field collections pupated. Pupation in the spring occurred from approximately May 3 to May 25, and the pupal stage was about 27 days. The emergence period extended from May 24 to June 15. The number of food plants appears to be fewer than that reported from eastern United States. Four species of parasites were reared from the smartweed borer, one of which was *Macrocentrus* n.sp. Five others appeared from smartweeds infested by the borer."

A new citrus cambium miner from Puerto Rico, E. P. Felt (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 2, pp. 117, 118*).—An itonid cambium miner working in grapefruit twigs in Puerto Rico is described as new under the name *Asynapta citrinae*.

Notes on the immature stages of Arkansas Tabanidae, H. H. Schwardt (*Jour. Kans. Ent. Soc., 4 (1931), No. 1, pp. 1–15*).—This report of studies conducted at the Arkansas Experiment Station in connection with the work previously noted (E.S.R., 63, p. 753) reports upon the results obtained from rearing to the adult stage 254 collected larvae, representing 15 species, of which 7 represent the genus *Chrysops* and 8 the genus *Tabanus*. A list is given of 11 references to the literature cited.

The use of parasiticides in combating Hypoderma bovis [trans. title], E. A. F. Baudet and E. de Boer (*Tijdschr. Diergeneesk., 60 (1933), No. 12, pp. 639–647; Ger., Eng., Fr. abs., p. 645*).—The authors report having obtained excellent results in the control of the northern cattle grub from the use of easily applied watery extracts of derris powder. It was found that in most cases a single washing is sufficient, while a second application a few days later destroys any grubs that may have escaped. Good results were also obtained from the use of rotenone in a 2 percent ointment.

Investigations on the buffalo fly, Lyperosia exigua De Meij. (*Aust. Council Sci. and Indus. Res. Pam. 43 (1933), pp. 40, figs. 7*).—The four contributions here presented are as follows: (1) The Host Preference of *Lyperosia exigua* De Meij. (Résumé) (pp. 7, 8) and (2) The Relation between the Adult *Lyperosia exigua* and Mammalian Faeces (pp. 9–19), both by B. J. Krijgsman and G. L. Windred, and (3) Some Food Reactions of the Larvae of *Lyperosia exigua* (pp. 20–22) and (4) The Influence of Moisture on the Larvae of *Lyperosia exigua* (pp. 23–38), both by G. L. Windred.

A systematic study of Trypetidae in the Japanese Empire, T. Shiraki (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 8 (1933), pp. 509, pls. 14, figs. 92*).—This is a comprehensive systematic account of the trypetid fauna of Taiwan (Formosa), Japan, Chosen (Korea), and Sakhalin, with descriptions of 165 forms representing 75 genera. Twenty genera are erected and 80 forms described as new. Their geographic distribution is graphically illustrated in tabular form. A seven-page list is given of references to the literature.

Report on investigations of the beet leaf maggot (Pegomyia hyoscyami Panz.) [trans. title], R. Mayné and W. Van den Bruel (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 2 (1933), No. 3, pp. 177–214, figs. 6*).—The observations here reported relate to the bionomics, natural enemies, and control of the spinach leaf miner on beets.

Chrysomelidae of Kansas, J. R. Douglass (*Jour. Kans. Ent. Soc., 2 (1929), Nos. 1, pp. 2–15; 2, pp. 26–38*).—This record of the Chrysomelidae brings together information on all the species known to occur in the State, their distribution, and information on their habits. A list of 47 references to the literature is included.

Notes on the biology of the lady-bird beetle, Ptychanatis axyridis Pall., Chia-chen Tan (*Peking Nat. Hist. Bul., 8 (1933), No. 1, pp. 9–18, pl. 1*).—Observations of the life history and habits of the ladybird beetle *P. axyridis* are presented.

The Coccinellidae of Kansas (Coleoptera), H. L. Gui (*Jour. Kans. Ent. Soc., 1 (1928), No. 2, pp. 2–13*).—An annotated list of the ladybird beetles of Kansas presented in connection with a list of 26 references to the literature.

Combating the sugarcane beetle by planting varieties of cane that give a better stand, J. W. Ingram, E. K. Bynum, and W. A. Douglas (*Sugar Bul., 11 (1933), No. 24, p. 4*).—Control experiments have led the authors to conclude that the planting of more vigorous varieties of sugarcane with increased stands per acre is the most promising method of combating injury by the sugarcane beetle. Information obtained is said to show that under certain conditions trapping with lights and picking out beetles is profitable.

Measuring the effect of sugarcane borer infestation upon the value of seed cane, W. E. Hinds and B. A. Osterberger (*Sugar Bul., 11 (1933), No. 24, pp. 4, 6*).—The studies conducted in 1929 and 1932 by the Louisiana Experiment Station show that "as borer infestation increases in seed cane of any variety there is a somewhat correspondingly close relationship to increase in the 'skips' or unoccupied stretches of row in the field. There is a corresponding decrease in the number of early developed sprouts, or a retardation in the germination of the cane. There is a distinct reduction in the number of stalks maturing for harvest. The decrease in yield varies decidedly with different varieties, and may range up to a loss of upward of 9 tons of cane per acre in the more heavily infested seed plats and with the more susceptible varieties of cane. The factor of borer-free seed is less important in the more vigorous-growing varieties of cane, but even in these varieties it is still decidedly important. Every reasonable effort to secure seed cane as free as possible from borer attack seems to be fully justified by these invetigations."

The white grubs or "hardback beetles" injurious to sugar-cane in British Guiana, L. D. Cleare (*Brit. Guiana Dept. Agr., Ent. Bul. 2 (1933), pp. II+28, pls. 2, figs. 3*).—This contribution deals with the economic history and importance and the life history and bionomics of dynastids injurious to sugarcane in British Guiana, particularly the large hardback *Ligyrus ebenus* DeG., the lesser or house hardback *Dyscinetus geminatus* F., and the small black hardback *D. bidentatus* Burm., their natural enemies, and prevention and means of control. A list is given of 14 references to the literature.

Report on missions sent to Madagascar in search of parasites in connection with the Phytalus problem in Mauritius, A. Moutia et al. (*Port Louis, Mauritius: Gen. Ptg. & Stationery Co., 1933, pp. [1]+6+[6], pls. 8*).—This is the final report of the entomological missions by Moutia and P. Regnard sent to Madagascar in search of scoliid (*Tiphia* and *Elis*), tachinid, and other natural enemies of the melolonthid larvae which attack sugarcane, resulting in the introduction of *E. pilosella* Sauss. into Mauritius. The details, presented in tabular form, are appended.

A method for rearing wireworms (Elateridae), H. R. Bryson (*Jour. Kans. Ent. Soc., 2 (1929), No. 1, pp. 15–21*).—In this contribution from the Kansas Experiment Station, the author describes a drain-tile cage method for rearing wireworms which apparently approaches very closely natural conditions and has given excellent results.

Of the wireworms collected and placed in cages made of 6-in. unglazed drain tiles, 38.9 percent emerged as adult click beetles, and it was possible to account for 44 percent of the 525 larvae placed in the tiles. Approximately 92 percent of the 199 beetles taken from their pupal cells were below the 6-in. plow line, with an average depth of a fraction over 9 in. The tile method is not only more economical than the salve box method, but also offers a greater opportunity for observing the food conditions. Since large numbers can be handled, this method will no doubt prove invaluable for rearing the beetles from the egg stage to the adult, as well as insure a better condition of specimens to be used in taxonomic studies.

The flight range of the honeybee, J. E. Eckert (*Jour. Agr. Res. [U.S.], 47 (1933), No. 5, pp. 257–285, figs. 8*).—The first attempts to determine the range of flight of the honeybee here reported were made in The Big Hollow, west of Laramie, Wyo., essentially a wind-blown stretch of prairie about 9 miles long by 3 miles wide and so called because its floor lies between 100 and 150 ft. below the level of the surrounding country and contains several fresh-water and alkaline lakes and several ridges. Experiments were also conducted near Powell, Wyo., and in the San Luis Valley of Colorado.

The observations on colonies of the honeybee located at known distances from artificial and natural sources of food indicated that bees will fly farther to natural than to artificial sources. When there was no source of food intervening, bees flew a distance of 8.5 miles to gather nectar and pollen. Colonies located within 0.5 to 2 miles of a given source of nectar made gains in weight, over a period of 3 years, as great as or greater than similar colonies located within the nectar-producing area, but colonies lost in weight when placed 5 miles or more from nectar. The concentration of bees located within a source of nectar was pronounced for a distance of 0.25 to 0.5 mile. Dispersion from an apiary was generally over a narrow angle in one direction, and the bees often flew considerable distances to secure nectar and pollen when similar sources were available nearby.

Some physiological effects of ultraviolet radiation on honeybees, L. M. Bertholf (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 6, pp. 375–398, figs. 5*).—Following a brief introduction in which five references are given to the literature relating to the subject, the author reports upon studies of the effect of irradiation with ultraviolet light on larvae and adults of both worker and queen honeybees. In these tests adult workers were irradiated in cages by exposing them to light from a quartz mercury-vapor lamp. The distance from the lamp, the length of exposure, and the wave length of the light were varied (the last by means of filters) in several combinations in the different tests.

For adult workers the larger doses decreased the average longevity; the smaller doses sometimes decreased and sometimes increased it. With equal quantities of radiation, wave length made very little difference. Irradiation of the food had no effect. On worker and queen larvae the light, especially the shorter waves, had a definitely harmful effect, but no shortening of the developmental period or increase in the weight of the emerging adults was found. Irradiation seemed to increase egg production slightly but resulted in considerable supersedure. The practice is not recommended, therefore, as commercially valuable.

The comparative value of different colonies of bees for fruit pollination, A. W. Woodrow ([*New York*] *Cornell Sta. Mem. 147* (*1933*), *pp. 29, fig. 1*).—This bulletin reports upon the subject under the headings of colonies studied, description of individual colonies, conditions in the apiary during the observations, observations, comparative flights of the several colonies, drifting, effect of temperature, effect of sunshine, weight of adult bees in relation to the amount of brood, results from package bees, and importance of colony strength.

The studies have led to the conclusion that the strength of the colony is apparently the most important factor in making honeybees useful for fruit pollination. Package bees do not fly so freely, under the same external conditions, as do established colonies of the same strength. No definite statement can be made of the minimum temperature at which honeybees will fly, for this is influenced by colony strength and by external factors.

Semi-solid medium for the cultivation of Bacillus larvae, A. G. Lochhead (*Bee World, 14* (*1933*), *No. 10, pp. 114, 115, figs. 3*).—Directions are given for the preparation of a yeast-carrot semisolid agar (E.S.R., 63, p. 359), which appears to possess some advantages over the solid agar and is a more delicate test medium for detecting the presence of viable spores of *B. larvae*.

The differential effect of environmental factors upon Microbracon hebetor Say (Hymenoptera: Braconidae) and its host Ephestia kühniella Zeller (Lepidoptera: Pyralidae), I, N. M. Payne (*Biol. Bul., 65* (*1933*), *No. 2, pp. 187–205, figs. 3*).—In the experiments here reported two strains of the Mediterranean flour moth, one of which develops much faster than the other at a given temperature, were used. Only one strain of the parasite, *M. hebetor*, was reared.

"If the parasite emerges during the larval stage of the host and is able to complete two generations during this stage, it can exterminate the host. If the parasite emerges at the beginning of the pupal period of the host, it can exterminate the slow strain of host only at 27° C., but it can overtake the fast strain at temperatures from 27° to 20°, inclusive. If the adult parasite emerges at the beginning of the egg stage, it can exterminate either strain of host except at 15° or below. In general, high temperatures (above 32°) favor the host; low temperatures (15° and below), the parasite. High relative humidity favors the host; low relative humidity, the parasite. Conditions other than physical, such as disease incidence and the webbing habits of the flour moth caterpillar, also affect the host parasite balance."

A list of 23 references to the literature is included.

The polymorphic forms of Melittobia chalybii Ashmead and the determining factors involved in their production (Hymenoptera: Chalcidoidea, Eulophidae), R. G. SCHMIEDER (*Biol. Bul., 65 (1933), No. 2, pp. 338–354, pl. 1*).—This is a report of studies of the biology of a chalcid which attacks the wasp *Trypoxylon politus* Say. It occurs in two forms, the type form and a short-lived form.

Investigations in the control of the cyclamen mite (Tarsonemus pallidus Banks), F. MUNGER (*Minnesota Sta. Tech. Bul. 93 (1933), pp. 20*).—The author finds that the cyclamen mite is common all over Minnesota in greenhouses in which its food plants are grown. While the cyclamen is a favorite host, the mite is destructive on a variety of plants. Its presence is manifested by the appearance of characteristically distorted leaves. "Since the youngest leaves and buds are attacked first it is difficult to detect the early stages of an infestation. Frequent and thorough inspection of the greenhouse by an entomologist is, therefore, recommended. Sprays and fumigants are not effective in ridding infested plants of the mites, although some workers report that the repellent effect of frequent nicotine sprays is sufficient to give good control. Hot water treatment appears to be the only method available for eradicating the mites from infested plants. Good results can be obtained by this method if the time and temperature are carefully regulated. The flower buds of older cyclamen plants cannot stand the hot water treatment."

A list of 29 references to the literature is included.

Rocky Mountain spotted fever (eastern type) in the Southern States: Report of six cases in Tennessee, W. LITTERER (*South. Med. Jour., 26 (1933), No. 5, pp. 407–415, figs. 6*).—The author concludes that the ticks transmitting the disease in the cases here noted may have been introduced from Montana into Tennessee by three foxhounds shipped from the vicinity of Helena, which is within an endemic area of the western type of Rocky Mountain spotted fever. It is thought that the virus was attenuated or modified by passage through a different tick (*Dermacentor variabilis* (the American dog tick) instead of *D. andersoni*), or climatic conditions or both.

ANIMAL PRODUCTION

The law of maximum normal nutritive value, E. B. FORBES (*Science, 77 (1933), No. 1995, pp. 306, 307*).—In this paper from the Pennsylvania Institute of Animal Nutrition, the author points out that the evidence accumulated over many years in feeding experiments justifies the following conclusions: (1) In a critical sense, foodstuffs cannot be evaluated individually, (2) the net energy values of individual foodstuffs are variable and cannot be considered standard measures, and (3) the most nearly logical, single, conventional measure of the whole nutritive value is the net energy of the nutritively complete ration.

On the basis of these ideas, a new principle was formulated called "The Law of Maximum Normal Nutritive Value", which is stated as follows: "An individual foodstuff expresses its normal and most characteristic nutritive value, for a given kind of animal, under specified conditions governing nutritive requirement, only as it is a part of a ration which is qualitatively complete and quantitatively sufficient, for the conditions existing—except as it may express the same value by virtue of the capacity of the animal temporarily to protect itself from food nutrient deficiency by drafts upon the nutritive reserves of its own body, or as it may express even higher apparent value, under certain pathological conditions, or during undernutrition, by virtue of the protective or body-sparing capacities of nutrients."

Some effects of chlorophyll in albino rat diet, F. R. EDWARDS and K. H. HOLLEY (*Jersey Bul. and Dairy World, 52 (1933), No. 29, pp. 903, 904*).—At the Georgia Experiment Station three groups of six rats each were fed the same basal diet free from chlorophyll. To this was added in one lot 10 mg and in another lot 30 mg of purified chlorophyll per animal per day. The 10-mg level was calculated to approximate per body weight unit that consumed daily by cattle on good pasture, while the amount fed in the third lot was assumed to be sufficient to indicate any unusual effects from consuming abnormal amounts of chlorophyll.

Up to 56 days on experiment the feed requirements per unit gain in weight were slightly and increasingly lower as the level of chlorophyll was raised. There were no significant differences in the hemoglobin of the blood from the animals in the different groups. This indicated that there was no basis for the theory that chlorophyll could be used in the regeneration of hemoglobin. The study also showed that better methods for detecting and determining chlorophyll decomposition products must be developed before material progress can be made in following chlorophyll through the animal body.

Vitamin A content of barley, E. H. HUGHES (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 7, pp. 487–494, figs. 3*).—A series of three experiments was conducted with rats at the California Experiment Station to determine the vitamin A content of barley and to compare it with that of yellow and white corn.

As the sole source of vitamin A barley in the diet did not produce normal growth in rats. With sexually immature rats the addition of vitamin A to the basal barley diet brought about a decided increase in growth and a normal oestrous cycle. Based on measurements of increased growth and by daily vaginal-smear records, it was found that barley contained more vitamin A than did white corn but had less than one sixth as much of this vitamin as yellow corn.

True and apparent digestibility of oat hulls and alfalfa meal by swine, with special reference to the ability of swine to digest cellulose and crude fiber, H. H. MITCHELL and T. S. HAMILTON (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 6, pp. 425–435*).—An experiment at the Illinois Experiment Station was planned to determine the true digestibility of oat hulls by swine. Two series of digestion and metabolism trials were conducted with four pigs. The ration fed in the first trial contained 30 percent of oat hulls and 70 percent of other constituents presumably completely digestible. In the second trial a mixture of cellulose and starch furnished the same amount of crude fiber as the 30 percent of oat hulls. A single digestion period on alfalfa meal was completed on one pig.

It was computed that the total digestible nutrients of oat hulls amounted to 26.8 lb. per 100 lb. and those of alfalfa meal to 31.3 lb. The metabolizable energy contents were 1,166 and 1,624 calories per kilogram of dry matter, respectively. At the level of feeding followed in this work the absorbed protein of both feeds was almost completely utilized in metabolism. The crude fiber of the oat hulls and alfalfa meal had an average digestibility of approximately 2 percent. The pure cellulose was digested to the extent of an average of 3.5 percent, with a range for individual pigs of from 0 to 9.2 percent. The results indicated that crude fiber and pure cellulose pass through the digestive tract of the pig practically untouched by bacteria or other agencies of digestion.

Studies on Vim Oat Feed.—I, The digestibility of Vim Oat Feed, C. J. Watson, G. W. Muir, W. M. Davidson, and J. I. Dore (*Sci. Agr., 13 (1933), No. 6, pp. 382–394; Fr. abs., pp. 409, 410*).—The digestibility of Vim Oat Feed, defined as consisting " of offal obtained in the milling of rolled oats from clean oats, and containing less than 28 percent of fiber, [which] must include not less than the mill run of oat middlings and not more than the mill run of oat hulls ", was determined at the Central Experimental Farm, Canada. In order to minimize the effects of errors the determination of coefficients of digestibility was made with a basal ration fed at a constant level of feed intake, at different levels of intake of a mixture of the basal ration with Vim Oat Feed, and of Vim Oat Feed alone.

When roughages were fed alone, the plane of nutrition within certain limits did not greatly influence the coefficients of digestibility. For Vim Oat Feed the coefficients of digestibility were low compared to such feeds as mixed hay, timothy hay, and oat straw. Mixing this feed with roughage lowered the digestibility of the crude fiber of the ration more than would be expected from a consideration of the digestibility of the nutrients in the hay and Vim Oat Feed. The results showed that Vim Oat Feed has a calculated feed value of less than one half the value of bran or oats and about three fourths the value of mixed hay, timothy hay, or straw.

Value of rice by-products as feeds (*Louisiana Sta. Bul. 242 (1933), pp. 7*).—Based on several years' results on the feeding of rice by-products to beef cattle, hogs, and poultry, recommendations are given by C. I. Bray and C. W. Upp for the efficient and economical use of these feeds. The suggestions by R. H. Lush regarding the use of such feeds by dairy cows are based on results obtained at other stations.

Mineral deficiency in the southern coastal belt of New South Wales, M. Henry and M. S. Benjamin (*N.S. Wales Dept. Agr., Sci. Bul. 42 (1933), pp. 21*).—The main results obtained in a " deficiency survey " of portions of the counties of Aukland and Dampier, New South Wales, are reported. While of a preliminary nature, these results justify the conclusion that a phosphorus deficiency of the soil is the cause of osteomalacia among the cattle of the area. It is suggested that the economic returns of the section could be increased by (1) application of superphosphates to the pastures, (2) feeding bone meal and phosphatic licks, (3) adding bran to the ration of dairy cows, (4) feeding crops grown on fertilized land, and (5) the introduction of new pasture plants, especially legumes, into the pastures.

Digest and copy of revised feeding-stuffs law (*New Jersey Stas. Circ. 290 (1933), pp. 8*).—A copy of the law, as amended in 1933, governing the manufacture and distribution of feeding stuffs in New Jersey (E.S.R. 43, p. 373).

Inspection of feeds, W. L. Adams and A. S. Knowles, Jr. (*Rhode Island Sta. Ann. Feed Circ., 1933, pp. 12*).—The guaranties and analyses for protein and fat are presented for 222 samples of feeding stuffs collected for official inspection in 1932 (E.S.R., 69, p. 90).

[Experiments with livestock in Pennsylvania] (*Pennsylvania Sta. Bul. 293 (1933), pp. 14–17, 24, 25, figs. 3*).—Data obtained in studies with livestock are reported for grades of feeder cattle for fattening, by F. L. Bentley, P. T.

Ziegler, and P. C. MacKenzie; methods of feeding swine and supplements to corn in fattening rations for swine, by M. A. McCarty; the optimum degree of fineness in grinding grains for growing and fattening swine, by McCarty and J. E. Nicholas; hothouse lamb production, by W. L. Henning, Ziegler, and MacKenzie; the effect of shearing on the rate and economy of gain of native fine wool feeder lambs, by Henning, T. B. Keith, J. F. Shigley, Ziegler, and MacKenzie; and linseed meal as a source of protein for growing and fattening lambs, by Keith, Henning, and MacKenzie.

In tests with poultry, information was obtained on relation of plumage changes to egg production, by D. R. Marble; and breeding high egg production strains, by E. W. Callenbach and Marble.

Growth and development of cattle and horses [trans. title], H. ISAACHSEN (*Meld. Norges Landbr. Høiskole, 13 (1933), No. 1–5, pp. 263–286, figs. 16*).—This paper from the Institute of Animal Nutrition, Royal Agricultural College of Norway, presents data covering the growth and development of cattle and horses from birth to maturity.

Dairying and cattle breeding [in Alaska], B. B. BURROUGHS (*Alaska Col. Sta. Bul. 2 (1932), pp. 25, 26, 27*).—Information on the progress of the work on the Holstein-Galloway cattle at Matanuska is contained in this report, including monthly milk records.

Determination of live-weight of cattle by measurement, S. G. SINGH (*Agr. and Livestock in India, 3 (1933), No. 2, pp. 144–151*).—A simple formula for arriving at the approximate weight of cattle was worked out by the Punjab Agricultural College, Lyallpur, based on certain body measurements. The adapted form was $\frac{G \times L}{X}$ = the live weight of the animals in seers, in which G equals girth in inches, L length in inches, and X equals 9 when the girth is below 65 in., 8.5 when the girth is between 65 and 80 in., and 8 when the girth is above 80 in. Girth measurements were taken just behind the shoulder, and the length represented the distance between the square of the buttock and the square of the shoulder.

Distribution of medullated fibre in New Zealand Romney fleeces, B. L. ELPHICK (*New Zeal. Jour. Agr., 44 (1932), No. 3, pp. 194–200, figs. 3*).—Fleeces of seven Romney sheep selected at random were sampled in great detail at the Massey Agricultural College, New Zealand, and the staples were tested by the benzol test (E.S.R., 68, p. 423). Maps showing the distribution of medullation are given.

A study of the maps indicated that as the degree of medullation increased the area affected spreads from the britch only. The flank was invaded before the rump, the rib before the back, and the shoulder before the withers. It was tentatively concluded that samples of the fleece from the britch, side, and shoulder on one side of the animal would give a true indication of the nature of the whole fleece, and that not less than four evenly spaced staples should be taken as a sample from any area. For improving the fleece the evidence indicates that the flank should be the critical point of examination.

Effect of the calcium-phosphorus relationship of the ration on growth and bone formation in the pig, R. M. BETHKE, B. H. EDGINGTON, and C. H. KICK (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 5, pp. 331–338, pl. 1, figs. 2*).—The Ohio Experiment Station made a study of the effect of the calcium-phosphorus ratio of the ration on its relation to vitamin D on growth and bone formation in the pig. Three tests were conducted with young pigs fed a basal ration of yellow corn, soybean meal, and salt, supplemented with varying amounts of calcium carbonate and steamed bone meal. The calcium-phosphorus ratio of these rations varied from 0.18 to 3.62 at different concentrations of these elements.

The best results in general were obtained in growth and bone formation with a calcium-phosphorus ratio between 1 and 2. When the ratio was greater than 3 the pigs became rachitic, and the requirements for vitamin D were increased. The concentration of calcium and phosphorus in the ration also exerted a marked effect. The evidence indicated that in the absence of added vitamin D the ration should contain not less than about 0.6 percent of phosphorus. The requirement of the pig for vitamin D can be minimized by the proper adjustment of the calcium-phosphorus ratio.

Proportions of meat scraps and dried milk in rations for starting chicks, R. E. Roberts and C. W. Carrick (*Poultry Sci., 12 (1933), No. 4, pp. 223–225*).—The relative value of different proportions of meat scrap and dried milk in rations for starting chicks was studied at the Indiana Experiment Station The study involved three lots of 98 chicks each fed for a period of 10 weeks on the same basal ration. The meat-and-bone scrap supplement was fed in the respective lots in percentages of 15, 10, and 5, while the dried skim milk was fed in the same amounts in the reverse order.

There was no difference between any of the rations in the rate of growth or mortality during the 10 weeks. The amount of feed required to produce a unit of gain was the same in all lots. The efficiency with which the sexes converted feed into gains was the same during the period from 4 to 10 weeks.

Vitamin A and D studies with growing chicks, H. S. Gutteridge (*Sci. Agr., 13 (1933), No. 6, pp. 374–381, fig. 1; Fr. abs., p. 409*).—In this study at the Central Experimental Farm, Canada, six lots of chicks were fed to determine the efficiency of cod-liver oil and pilchard oil in the production of normal bones and in the prevention of rickets. A basal ration free of vitamin A was fed in five lots, to which the oils were added at either 1 or 2 percent levels. The sixth lot received a standard ration containing 1 percent of cod-liver oil. All lots were irradiated for 10 minutes daily with a mercury vapor lamp except the lot receiving the basal ration only, which received 20 minutes' irradiation.

Both oils when used as supplements to a basal ration free of vitamin A increased the growth and prevented the development of deficiency symptoms. Neither pilchard oil nor cod-liver oil when fed at a 1 or 2 percent level with the basal ration supplied sufficient vitamin A to promote as rapid growth as occurred in the lot receiving the standard ration. The results indicated that pilchard oil and cod-liver oil were of equal value so far as their vitamin A content was concerned, with a suggestion that the pilchard oil was somewhat the more efficient in this respect.

Effect of sources of vitamin D on storage of the antirachitic factor in the egg, G. M. DeVaney, H. E. Munsell, and H. W. Titus (*Poultry Sci., 12 (1933), No. 4, pp. 215–222*).—The U.S.D.A. Bureaus of Home Economics and Animal Industry undertook a study to determine (1) the relative value of cod-liver oil and viosterol in the ration of hens as sources of vitamin D in egg yolks, (2) the relationship between the amounts of vitamin D in the ration and the amounts stored in the yolks at various levels of feeding, and (3) the limiting capacity of the hen to store vitamin D in the egg when fed either of these supplements. The eggs from 10 pens of Rhode Island Red hens fed varying amounts of vitamin D from several sources were used in this experiment, and the eggs from yearling hens on range receiving cod-liver oil were also included for comparative tests. The study covered a period from November through July.

In the amounts usually fed the vitamin D of cod-liver oil was more efficiently stored in egg yolk than was the vitamin D from an equivalent amount of viosterol. At a 2 percent level of cod-liver oil feeding the amount of vitamin D in the yolk was significantly higher than at a 1 percent level. Increasing the level to 4 and 6 percent did not result in greater storage. Within the limits studied, the antirachitic value of egg yolk varied with the potency of the viosterol in the diet. Irradiating for 15 minutes with a carbon arc lamp had practically the same effect on the vitamin D content of the yolk as 1 percent of cod-liver oil.

Effect of ration on yolk color, E. W. Henderson and H. L. Wilcke (*Poultry Sci., 12 (1933), No. 4, pp. 266–273, pl. 1, fig. 1*).—At the Iowa Experiment Station a study was conducted to determine whether or not factors other than the feed of the bird influenced the color of the egg yolks produced. Special attention was given to the possible influence of the abdominal fat on yolk color.

The results showed that the pigment of the ration was primarily responsible for the color of the egg yolk. Feeding dyes with the ration showed that the hen does not withdraw Sudan III from her body fat for deposit in the egg yolk. It required from 3 to 5 days for the feed to exert the initial visible influence on the color of the yolk, depending upon how soon production starts after feeding begins. The effect of the dyes may remain evident for as long as 20 days after dye feeding stops, depending upon the rate and time of production. The maximum effect of dye was obtained in approximately 14 days, but this also depended upon the rate of production. The time required for the development and production of an egg varied with individual hens.

Relation of time of laying and embryonic mortality, C. Nicolaides (*Poultry Sci., 12 (1933), No. 4, pp. 274–276*).—At the Massachusetts Experiment Station a study was carried out to measure the effect of time of laying upon embryonic mortality on the individual bird basis. No significant difference was found in the rate of embryonic mortality between eggs laid at different periods of the day. The greatest difference in this respect, and the difference was not statistically significant, occurred between eggs laid from 9 a.m. to 12 m. and those laid after 2 p.m. Cytological studies indicated that the blastoderms of eggs laid by high-hatching hens were further advanced at laying time, regardless of the time of laying, than those laid by hens of low hatchability.

Time and manner of determination of the malposition head-in-small-end-of-egg, T. C. Byerly and M. W. Olsen (*Poultry Sci., 12 (1933), No. 4, pp. 261–265, fig. 1*).—This study by the U.S.D.A. Bureau of Animal Industry was designed to obtain information concerning the time of determination of the malposition head-in-small-end-of-egg and the mechanism of its determination and at the same time to gather data on the lethal effect of this malposition. Several lots of eggs were incubated for different periods with small-end-up, large-end-up, or horizontally and then changed to one of these positions other than the initial one.

The malposition head-in-small-end-of-egg was usually determined during the second week of incubation. The adhesion of the allantois to the shell membrane was an important factor in restricting the movement of the embryo and probably partially fixed the hatching position. Embryos in the normal position had more than twice the chance of hatching as embryos with head-in-small-end-of-egg.

Effect of fluorine on growth, calcification, and parathyroids in the chicken, H. M. Hauck, H. Steenbock, J. T. Lowe, and J. G. Halpin (*Poultry Sci., 12 (1933), No. 4, pp. 242–249, fig. 1*).—The Wisconsin Experiment Station carried out three experiments with growing chicks and one with pullets to show the effects of feeding fluorides to chickens. Sodium fluoride was fed in amounts ranging from 0.015 to 1.2 percent of the ration.

No unfavorable effects were observed in the appearance or weight of chicks fed sodium fluoride up to levels of 0.15 percent. At the 0.3 percent level the appetite and weight of young chicks were depressed, but there was no effect on 2- and 3-month-old chicks. At a 1.2 percent level sodium fluoride was markedly toxic to chicks of all ages. There was an apparent lowering of serum calcium in young chicks ingesting 0.6 and 1.2 percent of sodium fluoride, but there was no evidence of any effect on the serum calcium or inorganic phosphorus of older chicks. Within the limits of the study there was no consistent effect on the bone ash. No significant effect on the kidney phosphatase or on the size and structure of the parathyroids due to sodium fluoride feeding was noted. Small hemorrhages were observed in the duodenal loop of some chicks at all levels of fluorine feeding. There was a depression of weight and a marked decrease in production of pullets ingesting 0.96 percent of sodium fluoride.

Sexual differences in calcification of chicks and the effect on assays, C. H. SCHROEDER (*Poultry Sci., 12 (1933), No. 4, pp. 256–260, figs. 3*).—Based on a study of thousands of X-ray photographs, the author has demonstrated a sex-specific difference in the calcification of homologous shaft bones of chicks. The proximal end of the metatarsi of cockerels showed but 81 percent of the calcification noted in female chicks when the assay was made roentgenographically. The tibiae of cockerels contained only 96.4 percent of the bone ash shown by females. The author believes that this sex difference is of sufficient magnitude to deserve consideration in the assay of bone calcification, especially when but small differences occur, when working with small populations, and when using the roentgenographic method.

Meat on the farm.—Part 4, Killing and dressing poultry, O. A. BARTON (*North Dakota Sta. Circ. 50 (1933), pp. 12, figs. 8*).—The generally accepted practices in killing and dressing poultry for home use, together with some of the more recently developed methods and practices employed at commercial killing plants, are presented in this publication.

DAIRY FARMING—DAIRYING

Temperature variations in bacteriological incubators, C. S. PEDERSON, M. W. YALE, and R. EGLINTON (*New York State Sta. Tech. Bul. 213 (1933), pp. 63, figs. 25*).—A study of the constancy and uniformity of temperature of 14 bacteriological incubators of different types revealed that a uniform temperature of 37° C. for 48 hours was never obtained. Within the limits of this study the greatest difference in temperature between two points in any incubator chamber was 11° and the least difference 2°. A method for estimating the temperatures of incubators from agar plate counts is described.

Incubators of the water-jacketed type were more uniform in temperature of chamber than were those of the anhydric type. In the latter type where high temperature heating elements were employed without definite provisions for directing the circulation of air currents, the greatest variations in temperature occurred. The method of ventilation as well as the relative humidity affected the temperature of the incubator.

[Experiments with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 293 (1933), pp. 6, 17–19*).—With dairy cattle results were obtained in studies on methods of curing hay, grazing fertilized pastures, sun-cured v. dehydrated roughages for dairy heifers, dehydrated corn v. silage, and crushed clover hay, all by S. I. Bechdel and P. S. Williams.

With dairy products data were obtained on the effect of quick freezing and hardening on the quality of ice cream, by C. D. Dahle and H. H. Bradley; causes of off flavors in ice cream, by Dahle and R. B. Carson; soft-curd milk, by F. J. Doan and R. D. Welch; and the acidophilus organism, by J. A. Sperry et al.

The organisation of dairy research in New Zealand, E. Marsden (*Jour. Dairy Res.* [*London*], *1* (*1929*), *No. 1, pp. 64–74*).—The author describes the history and the organization of the research work relating to dairying in New Zealand.

The dairying industry in eastern Australia, S. M. Wadham (*Jour. Dairy Res.* [*London*], *1* (*1930*), *No. 2, pp. 168–173*).—In this article, from the University of Melbourne, the author discusses the dairy situation in the dairying districts of the eastern states of Australia.

Influence of pasture management upon the grazing habits of dairy cattle, R. E. Hodgson (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 6, pp. 417–424, fig. 1*).—At the Western Washington Experiment Station an investigation was undertaken to obtain information on the physical activities of lactating cows subjected to different types of grazing. Holstein cows in about the same stage of lactation were divided into two lots of four head each. One lot was grazed continuously on a 2-acre pasture, and the grazing was maintained at the rate of two head per acre for 147 days. In the second lot a similar pasture was divided into six ⅓-acre plats, and each plat was grazed at the rate of 12 cows per acre for 147 days. The animals in this lot were rotated when the plats were grazed to a uniform height of about 1 in. Records were kept of the length of time spent in grazing and lying down and the number of times that each occurred daily.

Cows in the rotated group spent an average of 28 minutes less in grazing and 38.4 minutes more in lying down than similar cows on unrestricted pasture. The first group spent an average of 411.1 minutes daily in grazing and 192.4 minutes in lying. The average number of times that grazing and lying occurred in the rotated lot was 8.8 and 3.1, respectively, as compared with 7.9 and 2.4 for those continuously grazed. As the season advanced the cows in the rotated lot spent less time in grazing and more in lying, while the reverse was true in the lot continuously grazed. Increasing the number of days that cows were maintained on a rotation caused a marked increase in the number of times grazing occurred but did not materially increase the average time spent in grazing. When the number of days on individual plats in the rotation series was increased, it was accompanied by a decrease in live weight and a significant decrease in milk production.

Chemical composition of pasture grasses in Vermont, J. A. Newlander, C. H. Jones, and H. B. Ellenberger (*Vermont Sta. Bul. 362* (*1933*), *pp. 19, fig. 1*).—Continuing the study of pasture grasses (E.S.R., 68, p. 807), 86 samples of grass plucked from pastures representing one third of the towns of Vermont were analyzed. The calcium content ranged from 0.28 to 1.74 percent, averaging 0.83 percent, and the phosphorus content ranged from 0.16 to 0.57 percent, averaging 0.3 percent. The calcium-phosphorus ratio averaged 2.7:1.

The average percentage composition of the grasses was crude protein 18.3, crude fiber 20.5, nitrogen-free extract 46, and ether extract 2.6. The average calculated digestible crude protein and total digestible nutrients were 14 and 67.5 percent, respectively, and the nutritive ratio was 1:3.8. These results showed that Vermont pasture grasses are highly nutritious and liberally supplied with minerals.

Tests with five ⅛-acre plats of timothy meadow cut at weekly, 2-week, and 4-week intervals, twice with aftermath, and once with aftermath for two seasons, showed that as the number of cuttings increased the amount of digestible protein increased and the total digestible nutrients decreased. The more frequent the cuttings the higher were the percentages of calcium and phosphorus obtained. Cutting grass every 2 to 4 weeks and drying artificially resulted in a highly nutritious concentrated feed.

Grain as a supplement to pasture and other roughage for milk production, R. H. Lush (*Louisiana Sta. Bul. 241* (*1933*), *pp. 14*).—In order to obtain information on the amount of grain to feed dairy cows on pasture for maximum and for economical production, groups of cows were fed for 3 years on varying amounts of grain in addition to the roughage or pasture.

It was found that cows on a full feed of grain apparently increased milk production 60 percent over roughage alone, from 10 to 15 percent over low grain, and 10 percent or less over limited grain feeding. All cows on a full grain ration produced more milk than those on roughage alone, but 5 out of 11 cows on low or limited grain produced more than those on full feed. Cows on a limited or low grain ration dropped faster in production after June than those on full grain, probably due to an actual feed shortage. The average nutrients obtained from pasture were 44 percent for full grain feeding, 46 for limited feeding, and 72 percent for roughage alone.

On the basis of these results a feeding schedule is suggested by which more economical returns may be secured.

The feeding value of pea feed and other pea by-products for dairy cows, J. C. Knott, J. O. Tretsven, and R. E. Hodgson (*Washington Col. Sta. Bul. 287* (*1933*), *pp. 20*).—This study was undertaken to determine the apparent digestibility and feeding value of pea feed. This feed is a byproduct of the pea-splitting industry and was made up of approximately 50 percent each of pea hulls and weevil-damaged peas. Two digestion experiments were undertaken with three 2-year-old Holstein heifers, and in the first test pea straw was the sole source of feed while in the second pea straw and pea feed made up the ration.

The apparent digestibility of the nutrients of pea straw was dry matter 57 percent, crude protein 49, crude fiber 51, nitrogen-free extract 65, and ether extract 61 percent. The apparent digestibility of the pea feed nutrients as determined by difference was dry matter 88 percent, crude protein 82, crude fiber 87, nitrogen-free extract 93, and other extract 68 percent. The pea feed contained 14.8 percent of digestible crude protein and 78.4 percent of total digestible nutrients.

Two feeding trials using 12 and 10 producing cows, respectively, were conducted with a basal ration made up of alfalfa hay, silage, and a concentrate mixture. In the experimental ration 500 lb. of pea feed replaced 400 lb. of wheat bran and 100 lb. of linseed meal in the concentrate mixture. The experimental ration was equal to the basal ration, and the pea feed was quite palatable in all cases. On this basis it is concluded that pea feed is a valuable source of feed for cows and may be substituted for linseed meal and wheat bran in rations where practically 50 percent of the grain mixture is pea feed.

No standard name has been set up for this feed, but "pea feed" has been suggested as sufficiently descriptive. As marketed the feed is not uniform in composition, and chemical analysis should be used to determine the proportion of hulls to damaged peas.

Relative merits of high and low silage feeding to cows in milk, K. and R. S. Gupta (*Agr. and Livestock in India, 3* (*1933*), *No. 2, pp. 116–124*).—In order to verify results previously noted (E.S.R., 69, p. 705), 20 cows were selected and paired at the Imperial Department of Agriculture, Bangalore. The respective groups received 41.3 and 24.8 lb. of silage per 1,000 lb. of body weight. In addition both groups received ragi straw ad libitum; 4.5 lb. of a concentrate mixture of wheat bran, dried brewers' grains, and peanut cake per pound of milk produced; and 1.5 lb. of peanut cake per 1,000 lb. of live weight.

The cows in the low-silage group consumed enough ragi straw to make the food consumption approximately equal in both lots. The high-silage group had the greater increase in live weight. The quantity and quality of milk was practically the same in both lots. It was concluded that because of the high cost of making the silage the method of feeding in the low-silage group was more economical.

The mineral requirements of dairy cattle, J. A. Crichton (*Jour. Dairy Res.* [*London*], *2* (*1930*), *No. 1, pp. 1–37*).—This a review from the Rowlett Research Institute, Aberdeen, of the present knowledge of mineral metabolism and the mineral requirements of the dairy cow.

Effect of season on fat test and milk production of dairy cows, F. B. Headley (*Nevada Sta. Bul. 131* (*1933*), *pp. 11, figs. 7*).—This study was based on the records of the grade Holstein herd at the Newlands Field Station at Fallon for the years 1926 to 1932, inclusive.

It was found that the percentage of fat in the milk was highest during the winter months and lowest during July and August. The high test may occur at any time between October and March, but the low test was quite uniform for July and August. This seasonal variation was not due to changes in ration, the difference being as great with cows on unvarying rations throughout the year. With increasing age the butterfat test of cows gradually decreased. The time elapsing after freshening and before drying up also affected the butterfat test. In this work the cows tested 3.7 percent the first month after calving, 3.44 the second month, 3.4 the third, and then gradually increased to 4.1 percent during the last month. Cows freshening in January had the highest milk production during the first five months, while those freshening in September had the lowest production. Prices received for butterfat and milk were highest during the winter months and lowest during the summer months.

Daily variations in the freezing point of milk, H. A. Schuette and E. O. Huebner (*Wis. Acad. Sci., Arts, and Letters, Trans.*, *28* (*1933*), *pp. 267–274*).—This investigation was undertaken to study (1) the influence exerted upon the freezing point of milk by such factors as stage of lactation, day-by-day composition from individual cows, and the presence of colostrum, and (2) variations in the freezing point of herd milk, of which herd the individual animals studied were members.

It was found that the freezing point of milk produced by an individual well fed cow under normal conditions did not vary more during a 30-day period than did milk of the herd of which she was a member. The freezing point was independent of the period of lactation, but was affected by the presence of colostrum. Each animal regulated the concentration of those substances with which an osmotic equilibrium is maintained within the body.

Methods of determining the numbers of bacteria in milk, A. T. R. Mattick (*Jour. Dairy Res.* [*London*], *1* (*1930*), *No. 2, pp. 111–135*).—In this paper from the University of Reading, England, the author appraises and estimates, so far as the available evidence permits, the comparative values of the various tests for determining the bacterial content of milk and considers their advantages and limitations when used for particular purposes.

No one method was found capable of giving exact information as to the number of living bacteria in milk. While the plate count is subject to a number of limitations as to its accuracy, figures are presented to show that with milk properly produced and handled the bacterial content will be, even 24 hours after milking, within the range where the plate count is more reliable than any other method. It was not believed that there was justification for attempting to separate milk into classes that are not broad enough to include the variations which occur. This is especially true when the counts exceed 200,000 per cubic centimeter. Since keeping quality depends upon the kind as well as the number of bacteria, it would seem wise to supplement bacterial examinations with determinations of keeping quality and of organisms of the coliform type. The methods that are excellent for the rapid classification of milk into broad grades are, due to their nature, somewhat inaccurate. The reductase test does not give accurate information as to the number of bacteria in milk.

A comparative study of milk in bottles with single and double caps, M. L. Isaacs and I. Zeiber (*Amer. Jour. Hyg., 16 (1932), No. 3, pp. 806–822, figs. 5*).—The object of this investigation was to determine the extent of contamination that occurs in milk bottled with ordinary single caps as compared with double-capped bottles. The study covered a period from April through July. The Standard Methods count, the *Bacillus coli* test, and in some cases tests for anaerobic organisms were used.

Bacteria were found to be more numerous on single caps than on the inner of the double caps. Anaerobic sugar-fermenting organisms, probably *B welchii*, were found on the single caps but not on the inner of the double caps. *B. coli* was found on 61 percent of the single and 13.6 percent of the double caps. In the surface cream bacterial counts averaged from 51 to 121 percent higher for the single-capped bottles.

B. coli was present on the surface of the cream of only 10 percent of the double-capped bottles but on 47.5 percent of the single-capped bottles. Bacterial counts of whole milk were between 38 and 64 percent higher in the single-capped bottles. It is concluded that under certain conditions milk bottles sealed with an ordinary disk-type cap may be definite health hazards.

Factors affecting the rate of ripening of New Zealand export cheese, W. Riddet, F. H. McDowall, and G. M. Valentine (*New Zeal. Dept. Sci. and Indus. Res. Bul. 38 (1933), pp. 40, figs. 15*).—The Dairy Research Institute, New Zealand, undertook this investigation in an attempt to estimate the effect of various factors known from previous research work and from practical experience to affect the rate of ripening of cheese.

It was found that when 5 oz. of rennet per 1,000 lb. of milk were used instead of 3 oz. there was a more rapid break-down in the earlier stages of ripening and an increase in the proportion of soluble nitrogen. At the same time there was a tendency to accentuate any off flavors and to develop stickiness in the body of the mature cheese. A 30 percent increase in the amount of rennet would be advantageous in making cheese to be sold for consumption soon after manufacturing. Holding cheese at 60° F. instead of from 45° to 50° in the curing room increased the soluble nitrogen and promoted more rapid ripening. Holding for an extra 2-week period at 60° was more effective than holding for an extra 6-week period at 45° to 50° subsequent to the normal 2-week holding period in the curing rooms. The cheese kept at the higher temperature had a somewhat more open texture than that held at the lower temperature, but good cheese closed up to some extent as it matured. Soft-bodied, high-moisture cheese matured very rapidly, especially at the higher temperature, and then deteriorated very rapidly with frequent development of discoloration. The high temperature in the curing room increased the shrinkage during the early stages of ripening, but the rate of loss decreased during the later stages.

The effect of heat upon the rennin coagulation, I, G. M. MOIR (*Jour. Dairy Res.* [*London*], *2* (*1930*), *No. 1, pp. 68–75, figs. 2*).—Experiments were carried out at the National Institute for Research in Dairying in which the heat coagulation time of flash-pasteurized milk was observed and compared with the analyses of the whey obtained after coagulation.

Analyses showed that the mineral content of the whey separated from the coagula of raw and pasteurized milk depended largely upon the acidity. The increase in coagulating time produced by pasteurization was associated with a decrease in the whey nitrogen, indicating that one is approximately a linear function of the other. The chemical changes brought about by flash pasteurization were apparently increased by the use of higher temperatures and also by the treatment of milk of low sanitary quality, as compared with clean milk.

Pasteurized milk for Cheddar cheese-making, I, II, G. M. MOIR (*Jour. Dairy Res.* [*London*], *1* (*1930*), *No. 2, pp. 149–167, figs. 3; 2* (*1931*), *No. 2, pp. 176–178*).—In this study at the National Institute for Research in Dairying, England, part I, A Preliminary Chemical Investigation, was primarily intended to discover the chemical differences between the ripening of cheese made from raw and from pasteurized milk. Two sets of three loaf Cheddar cheeses were made from clean milk and market milk, respectively. In each set there was one cheese made from raw milk, one from milk flash-pasteurized at 165° F., and one from milk flash-pasteurized at 185°.

Analyses of the whey from each cheese showed a tendency, especially with the market milk of lower quality, for pasteurization to cause more of the soluble milk proteins to be incorporated in the cheese. When acidity developed rapidly in the whey after cutting, the resulting cheese lost a portion of its mineral constituents. A bitter flavor developed in cheese made from pasteurized milk, being quite pronounced in that made from milk heated to the higher temperature. Chemical analyses showed in both sets of cheese that pasteurization reduced the quantity of ultimate decomposition products that develop during the ripening process.

Appended is a summary of the analytical methods used in the study.

Part II, The Mineral Content of Cheddar Cheese, deals with several pairs of cheese, one cheese of each pair being made from pasteurized milk and one from raw milk.

Whey drawn from the different vats was filtered through a close-textured cloth. The whey from raw milk filtered readily and left practically nothing on the cloth, while that from the pasteurized milk, especially that heated to a high temperature, filtered slowly and left a colorless, rather gelatinous, layer. It was evident that pasteurization modified the milk so that the lactic acid organisms could develop much more rapidly. One result of this altered development was the production of a cheese possessing a different mineral content and a different pH.

Studies in the ripening of Cheddar cheese, L. A. ALLEN (*Jour. Dairy Res.* [*London*], *2* (*1930*), *No. 1, pp. 38–67, figs. 6*).—An investigation was undertaken at the National Institute for Research in Dairying, England, to study the chemical and bacteriological changes involved in the ripening of Cheddar cheese. Two sets of cheese were made, one set from Grade A milk (tuberculin tested) and the other from market milk sold for cheese making.

The chemical analyses showed a higher titratable acidity and a more extensive proteolysis in the cheese made from the market milk. The bacteriological studies carried out on the same cheese indicated that the difference was due, either directly or indirectly, to the more rapid development of the lactic acid bacteria in the market milk cheese. This was thought to be due to the fact that lactic acid organisms grow more readily in a medium in which protein-splitting organisms have already grown, and these are present in greater quantities in market milk than in clean milk. The market-milk cheese by its open texture and more pungent flavor showed that it ripened quicker than the clean-milk cheese. The latter was preferable on account of its clean after-flavor and the complete absence of local discoloration.

An investigation was made of the action of amino acids on the bacteria in cheese. A mixture of alkali-forming organisms was inoculated into synthetic media containing an amino acid or a mixture of amino acids as a source of nitrogen. Only *Bacillus lactis aerogenes* was capable of vigorous and sustained growth in any of the media. This organism deaminated glutamic acid and decreased the alcohol-formol titration. With arginine nitrogen a considerable increase in this value was observed. With a mixture of three amino acids a larger increase in acidity was obtained than with any acid alone. These results indicate that certain bacteria are capable of causing fluctuations in the value of alcohol-formol titration by decomposition of the amino acids.

Rusty spot in Cheddar and other cheese, I–III (*Jour. Dairy Res.* [*London*], *1* (*1929*), *No. 1, pp. 50–57, pl. 1; 1* (*1930*), *No. 2, pp. 136–148; 2* (*1931*), *No. 2, pp. 190–202, fig. 1*).—This study was made at the National Institute for Research in Dairying, England.

I. *Description of the causative organism*, J. G. Davis and A. T. R. Mattick.—The organism causing "rusty spot" in Cheddar cheese was isolated and described. It was found to be an anaerobe that formed pigment only under certain conditions, and appeared to be one of the true lactic acid bacteria which under favorable conditions produced the discoloration of Cheddar cheese.

II. *Factors controlling the pigmentation of the causative organism*, J. G. Davis and A. T. R. Mattick.—In this study of the conditions controlling the pigmentation of the organism causing "rusty spot" in Cheddar and other hard cheese, it was observed that media containing tissue extracts promoted pigmentation of the organism, and growth but no pigmentation was obtained with a medium containing a fermentable carbohydrate and a suitable protein digest. The factors appearing to govern the growth and pigmentation of the organism were (1) a range of oxidation-reduction potential below that at which litmus is reduced, (2) moisture, (3) surface, (4) a fermentable carbohydrate, (5) a minimum concentration of soluable available nitrogen, and (6) a factor having properties similar to those of vitamin B_1. Some of the properties of this latter factor are described. A discussion of the relation of this study to rusty spot in cheese is presented.

III (A). *Further factors controlling pigmentation*, A. T. R. Mattick and J. G. Davis (pp. 190–194).—It was found that the most important factor in the growth of the red spot organism was the presence and growth of certain other bacteria. The studies showed that this stimulation was a function of the living organism. It was also found that those organisms which stimulated growth and pigmentation always induced a higher negative potential, while the organisms that did not have this stimulating effect attained potentials considerably more positive.

III (B). *The application of the results of laboratory investigations in cheese-making*, A. T. R. Mattick, J. G. Davis, and D. V. Dearden (pp. 194–201).—Investigations were made of the influence of factors such as variations in the method of manufacture and the composition of the milk and curd on the incidence of this defect under practical cheese-making conditions. No correlation was found between the pH concentration and other properties of ripe cheese and the extent of red spot. Measures for controlling this defect are suggested.

The use of dry skim milk in the manufacture of cultured buttermilk, E. E. Alldredge and A. D. Burke (*Alabama Sta. Bul. 239 (1933), pp. 39, figs. 14*).—These studies were undertaken to determine the factors and plant practices essential to the preparation of high quality cultured buttermilk made with dry skim milk.

When reconstructed skim milk was used the most desirable flavor, body, and texture were obtained when the milk contained 10 percent of total solids. The curd of the buttermilk should be cooled to 50° F. or lower before breaking. The addition of 5 percent of starter was satisfactory for the development of the proper acidity, flavor, body, texture, and viscosity. From the standpoint of flavor, an acidity of from 0.95 to 1 percent in the finished product gave best results. The flavor improved after 24 hours in cold storage. The curd of cultured buttermilk made from dry skim milk broke more readily and the body and texture of the finished product was smoother and more creamy than that made from normal skim milk. Viscolization of reconstructed skim milk before culturing had no apparent beneficial effects. Vigorous agitation caused many of the major defects, especially wheying-off, of cultured buttermilk. The removal of air under vacuum returned a badly wheyed sample to its original state. Incorporating excessive air caused a porous, broken, and gassy appearance of the curd and produced a thin, flat, watery taste. Pumped buttermilk had a porous, open, broken appearance and lacked smooth consistency due to the air incorporation which occurred regardless of the temperature of pumping, type and speed of pump, and condition of curd.

Different cultures caused a variation in the flavor, viscosity, and acidity. Adding small amounts of dry skim milk to normal skim milk prior to fermentation increased the viscosity and improved the flavor and consistency of the resulting product. Flavor, aroma, and desirable physical properties of the buttermilk could be maintained for several days at a storage temperature of from 35° to 38°.

Practical recommendations and suggestions are given for the preparation of high-quality cultured buttermilk from dry skim milk.

The ice cream industry of Vermont, R. W. Smith, Jr. (*Vermont Sta. Bul. 363 (1933), pp. 12, figs. 2*).—A survey was made of 38 establishments producing ice cream in the State in 1929. Of these plants 13 were making 91 percent of the total production, estimated at 891,722 gal. per year. Approximately one half of the butterfat used in the manufacture of the ice cream was imported from other States. The per capita annual consumption was approximately 2 gal., which is two thirds of the average of the country as a whole. In general the quality of Vermont ice cream was good, but there was still opportunity for improving the quality and sanitary condition of ice cream made in some of the smaller plants.

VETERINARY MEDICINE

Text-book of meat hygiene, with special consideration of antemortem and postmortem inspection of food-producing animals, R. Edelmann, rev. by J. R. Mohler and A. Eichhorn (*Philadelphia: Lea & Febiger, 1933, 6. ed., rev., pp. VI+17–474, pls. 5, figs. 162*).—This is a revision of the work previously noted (E.S.R., 53, p. 278).

[Report of work in animal pathology at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 293 (1933), p. 14*).—The work of the year with animal diseases briefly referred to includes that with nicotine for roundworms of fowls, by J. E. Hunter, H. C. Knandel, and D. E. Haley, and big liver disease of fowls, by A. K. Anderson, J. A. Sperry, Knandel, J. F. Shigley, and S. Burt.

[Reports of work in animal pathology in the Union of South Africa] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 1 (1933), No. 1, pp. 401, figs. 121*).—This quarterly journal, which is intended to form a direct continuation of the annual reports of the director of veterinary services and animal industry (E.S.R., 69, p. 420), presents the following contributions: Mortality in Fowls due to *Aegyptianella pullorum*, by J. D. W. A. Coles (pp. 9–14); The Transmission of *Aegyptianella pullorum* Carpano to Fowls by Means of Ticks Belonging to the Genus *Argas*, by G. A. H. Bedford and J. D. W. A. Coles (pp. 15–18); The Immunization of Mules with Formalysed Horsesickness Virus, II (pp. 21–24) (E.S.R., 69, p. 420), and The Immunization of Horses against Horsesickness by the Use of Formalysed Virus, Part II (pp. 25–50) (E.S.R., 64, p. 771), both by P. J. du Toit, R. A. Alexander, and W. O. Neitz; Rabies in South Africa: Occurrence and Distribution of Cases during 1932, by W. O. Neitz and A. D. Thomas (pp. 51–56); The Administration of Anthelminthics to Horses in Bran, by H. O. Mönnig and I. P. Marais (pp. 59–61); The Cause of Nodular Enteritis in Cattle (pp. 63–65), The Chemotherapy of Oesophagostomiasis in Sheep (pp. 67–76), and Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants, Part III (pp. 77–92) (E.S.R., 69, p. 420), all by H. O. Mönnig; *Ozolaimus megatyphlon* (Rud., 1819), a Little Known Helminth from *Iguana tuberculata* (pp. 93–96), *Joyeuxia fuhrmanni* Baer 1924, a Hitherto Unrecorded Cestode Parasite of the Domesticated Cat in South Africa (pp. 97, 98), and On Some South African Reptilian Oxyurids (pp. 99–114), all by R. J. Ortlepp; Studies on the Alimentary Tract of the Merino Sheep in South Africa—I, Investigations into the Physiology of Deglutition, by H. O. Mönnig and J. I. Quin (pp. 117–133); A Study of the Duration of Motility of Spermatozoa in the Different Divisions of the Reproductive Tract of the Merino Ewe, by J. Quinlan, G. S. Maré, and L. L. Roux (pp. 135–145); Plant Poisoning in Stock and the Development of Tolerance (pp. 149–156), The Toxicity of Sodium Chlorate (pp. 157–162), *Lathyrus sativus* L. (Chickling Vetch, Khesari, Indian Pea) as a Stock Food (pp. 163–171), Recent Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa (pp. 173–182) (E.S.R., 69, p. 421), and Fungi in Relation to Health in Man and Animal (pp. 183–212), all by D. G. Steyn; A Short Summary on Our Botanical Knowledge of *Lolium temulentum* L., by A. C. Leemann (pp. 213–218); Poisoning of Human Beings by Weeds Contained in Cereals (Bread Poisoning), by D. G. Steyn (pp. 219–266); Chemical Blood Studies—I, Comparative Studies on Blood, "Laked" and "Unlaked" Blood Filtrates of Animals in Health and Disease, with Particular Reference to Methods and Technique Employed, by H. Graf (pp. 269–278); Chemical Blood Studies—II, A Contribution to the Determination of Urea in Animal Blood Filtrates ("Laked" and "Unlaked"), by T. J. Wilken-Jorden and H. Graf (pp. 279–283); and Chemical Blood Studies—III, Comparative Studies on "Laked" and "Unlaked" Blood Filtrates of Sheep in Health and during "Heartwater" (*Rickettsia ruminantium* Infection) and Bluetongue (Catarrhal Fever) (pp. 285–334), IV, Comparative Studies on "Laked" and "Unlaked" Blood Filtrates of Horses in Health and during Horse-Sickness (Pestis Equorum) (pp. 335–369), and V, Comparative Studies on "Laked" and "Unlaked" Blood Filtrates of Bovines in Health and during Anaplasmosis (*A[naplasma] marginale* Infection) and Piroplasmosis (*P[iroplasma] bigeminum* Infection) (pp. 371–401), all by H. Graf.

Bacterial variation, with special reference to pleomorphism and filtrability, L. F. Rettger and H. B. Gillespie (*Jour. Bact., 26 (1933), No. 3, pp. 289–318, pl. 1*).—The authors have found *Bacillus megatherium* to be extremely susceptible to changes in environment, giving rise to morphological types which vary over a wide range from the more nearly "normal" to most extreme forms. "On the transfer of cultures which have undergone such cellular transformation to the usual fresh culture medium, the organism again assumes its regular cell outline and orientation. In old cultures pronounced autolysis is another outstanding feature, and at times empty cells may be seen which resemble flattened tubes or 'sausage skins' and which are firm and highly resistant to mechanical injury. These must be regarded as definite cell envelopes or membranes."

Repeated attempts to demonstrate the occurrence of a filtrable phase or phases in *B. megatherium*, *Brucella abortus*, and *B. melitensis* and the organisms commonly present in raw sewage resulted in failure.

Bacterial variation and dissociation, E. M. Robinson (*So. African Biol. Soc. Pam. 6 (1933), pp. 22–24*).—This brief discussion includes a comparison of the smooth and rough types.

Vital staining in relation to cell physiology and pathology, R. J. Ludford (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 8 (1933), No. 4, pp. 357–369, figs. 2*).—This account has been prepared with a view to directing attention to certain aspects of recent work which have opened up wide fields for further investigation.

Prophylaxis of the babesiases and anaplasmosis of domestic animals in Brazil [trans. title], C. Pinto (*Arch. Escola Super. Agr. e Med. Vet. [Rio de Janeiro], 10 (1933), No. 1, pp. 99–131, figs. 9*).—In addition to control methods, including pasture rotation, dipping, and spraying, the several tick-transmitted diseases of livestock in Brazil and the ticks implicated in their transmission are considered.

The reaction of antisera for B. actinoides, J. B. Nelson (*Jour. Bact., 26 (1933), No. 3, pp. 321–327, figs. 2*).—The author has found suspensions of *B[acillus] actinoides* of bovine origin and of its rodent variety made from washed and desiccated bacteria to be sufficiently stable for agglutinative purposes. "A rabbit antiserum for the rodent organism agglutinated a suspension of the homologous variety through a dilution of 1:3,200 and of the heterologous variety through a dilution of 1:400. An antiserum for the bovine organism agglutinated both suspensions through a dilution of 1:800. The bearing of these findings on the relationship of the two organisms is considered. Both organisms showed an atypical growth, characterized by a predominance of spherical bodies, in homologous antiserum at the base of slanted agar. Cultures in heterologous antiserum showed only an occasional group of similar forms. The nature of this degenerative reaction is discussed."

Multiple toxins produced by some organisms of the Cl. welchii group, A. T. Glenny, M. Barr, M. Llewellyn-Jones, T. Dalling, and H. E. Ross (*Jour. Path. and Bact., 37 (1933), No. 1, pp. 53–74, figs. 5*).—In the studies conducted the authors have found culture filtrates of *B[acterium] paludis* and the lamb dysentery bacillus to contain at least four toxins, for each of which there is a specific antitoxin. "The existence of these toxins has been demonstrated by means of titrations by different methods against a number of sera; this has revealed the deficiency, in certain sera, of one or more of the specific antibodies. The relative proportions of each antibody in a serum depend chiefly upon the normal antitoxin content before immunization of the horse providing the serum. The mouse intravenous method of testing does not measure any single antitoxin reaction."

Does immunity between cow pox and foot-and-mouth disease occur? [trans. title], L. de Blieck and J. Jansen (*Tijdschr. Diergeneesk., 60 (1933), No. 14, pp. 769–780; Ger., Eng., Fr. abs., pp. 779, 780*).—It is concluded that in guinea pigs there is no cross-immunity between cowpox and foot-and-mouth disease.

Infection in mice following nasal instillation of louping-ill virus. L. T. WEBSTER and G. L. FITE (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 656, 657*).—The regular transmission of a fatal infection to mice through nasal instillation of louping ill virus has been effected by the employment of brother-sister inbred strains of mice.

Studies on infection by and resistance to the Preisz-Nocard bacillus.—II, Susceptibility of the guinea-pig and the distribution of lesions after cutaneous and subcutaneous inoculation and ingestion, C. G. DICKINSON and L. B. BULL (*Aust. Jour. Expt. Biol. and Med. Sci., 8 (1931), No. 2, pp. 83–90*).—The results obtained in further work (E.S.R., 65, p. 570) are outlined, mainly as a record of the lesions that may result from infection of the guinea pig by the Preisz-Nocard bacillus. It is concluded that the guinea pig differs from other animals in the susceptibility of certain tissues, notably those of the liver and spleen, and it is pointed out that in this respect the same susceptibility is found in experimental tuberculosis.

Studies on infection by and resistance to the Preisz-Nocard bacillus.—III, Some preliminary observations on experimental and natural infections of the sheep, L. B. BULL and C. G. DICKINSON (*Aust. Vet. Jour., 9 (1933), No. 3, pp. 82–93*).—The authors have recovered the Preisz-Nocard bacillus "with comparative ease from the soil of the camping grounds of sheep on a certain property where caseous lymphadenitis is enzootic. The evidence suggests that the bacilli may have grown in the soil and accumulated vegetable matter in these camping grounds during those months when the moisture content of the soil was favorable. After the soil had become dry, examinations failed to demonstrate the presence of the bacilli in those situations where it had been found earlier. Infections of wounds in the paddocks is illustrated by the development of caseous lymphadenitis in crossbred lambs after marking operations. The wounding of animals during shearing with subsequent infection of the wounds in the paddocks is a possible explanation of a proportion of the infections found on this property. If the animals can be turned into clean paddocks immediately after marking or shearing there is a reasonable possibility of limiting infection on this property."

Rocky Mountain spotted fever: Susceptibility of the dog and sheep to the virus, L. F. BADGER (*Pub. Health Rpts. [U.S.], 48 (1933), No. 27, pp. 791–795, fig. 1*).—In experiments in which two grown dogs and one puppy were inoculated with the virus of Rocky Mountain spotted fever, no clinical manifestation appeared in the older dogs, but the puppy reacted with fever and respiratory symptoms. The virus was recovered from one of the older dogs on the fourth and sixth days and not on the eighth and tenth days after the inoculations, while from the other it was recovered on the fourth, sixth, and eighth days and not on the tenth day after the inoculation. Attempts to recover the virus from the puppy on the first and second days after inoculation failed, while an attempt on the fourth day was successful. A grown dog, raised in an endemic area of spotted fever, was apparently immune to the virus.

"*Dermacentor andersoni* ticks infected with the virus of Rocky Mountain spotted fever were fed on two puppies. After incubation periods of five and six days the puppies developed clinical manifestations, and the virus of spotted fever was recovered from each. A young sheep, born after the close of the tick season, was inoculated with the virus of Rocky Mountain spotted fever. The virus of spotted fever was recovered from this sheep on the fourth, sixth, eighth, and tenth days after the inoculation."

The elimination of Brucella abortus from the genital tract of unbred heifers during estrum, W. M. THOMSON (*N.Y. State Vet Col. Rpt. 1930–31, pp. 123–137*).—In the investigation here reported "samples of vaginal mucus, covering 44 periods of oestrum in 11 heifers infected with *B. abortus*, were negative to that organism as determined by 145 guinea pig inoculations. Two samples taken in one period of oestrum were positive, but two others taken from the same animal 2 days earlier were negative. Inasmuch as this animal usually struggled violently while the samples were being taken, fecal contamination may have been responsible for this single positive result. The agglutinins appeared in the blood stream from 1 to 4 weeks before the complement-fixing bodies could be detected.

"While the heifers must be kept under observation longer before a general rule can be established, there is a tendency in the animals overcoming the reactions for the complement-fixing bodies to disappear first."

A study of some factors that influence the agglutination test for Bang abortion disease in cattle, C. H. MILKS (*N.Y. State Vet. Col. Rpt. 1930–31, pp. 85–116*).—The author concludes that the agglutination test as described for most laboratories is reasonably accurate in diagnosing infectious abortion of cattle.

"Variations in the density of the antigen as run by different laboratories are not sufficiently great to interfere seriously with the correct interpretation of results. Maximum agglutination titers vary in accordance with the concentration of the antigen. This is important only when sera with a medium agglutinin content are being tested. The Gates opacimeter allows a more delicate comparison of opacities within a narrow range than is possible with the McFarland nephelometer. The optimum opacity as determined according to the McFarland nephelometer is 1. The optimum opacity as determined by the Gates opacimeter appears to be between 6 and 6.5 cm. The final reading of sera set with carbolized antigen should not be made before the forty-eighth hour of incubation. Live antigen, standardized at 6–6.5 cm on the Gates opacimeter as used in this laboratory, was found to be more uniform in its results than the carbolized antigen. In addition, the live antigen needs only 6 hours' incubation with overnight refrigeration, while the carbolized antigen requires 48 hours' incubation.

"A change toward a standard, within certain limits, in the opacity of the antigen used by laboratories, is desired."

Bovine infectious abortion series.—Twelfth report, A study of agglutination reactions in the diagnosis of Bang's abortion disease, G. C. WHITE, R. E. JOHNSON, W. N. PLASTRIDGE, and R. P. REECE ([*Connecticut*] *Storrs Sta. Bul. 185 (1933), pp. 15*).—In the introductory part of this twelfth report (E.S.R., 60, p. 577), the authors quote the standard method of procedure adopted in 1931 by the Eastern States Conference on Bang's Abortion Disease. Data are then presented on nonspecific, incomplete agglutination reactions in 47 abortion-free herds taken from routine records covering a period of from 2 to 6 years on the several herds.

"Of a total of 6,958 serological samples from 1,758 different animals, 1,729, or 25 percent, agglutinated to a limited extent in the 1:25 dilutions in all but two cases. The 1+ and 2+ readings in the 1:25 dilution were decidedly the most common, but 3+ readings in 59 samples and 4+ in 10 samples were recorded. If the 1:25 dilution be disregarded, partial reactions occurred in a total of 411, or only 5.91 percent of the samples, mostly distributed between 1+ and 2+ readings in the 1:50 dilution. In view of the fact that the great majority of nonspecific reactions occur in the 1:25 dilution, and due to the confusion that this may occasion the layman and veterinarian in the field, it seems logical to recommend that results in the 1:25 dilution be omitted from laboratory reports.

"It is a striking fact that even slight reactions occur rather rarely in the 1:100 and 1:200 dilutions in the routine testing of abortion-free herds. The total number of reactions (only partial) occurring in these higher dilutions was 20, or 0.29 percent of the total tests, and only 1 (1+) occurred in the 1:200 dilution. This is an amazingly small proportion, and . . . constitutes an impressive tribute to the dependability of this biological test.

"In 121 positive, or infected, herds, 66.7 percent of the animals were negative, 14.1 percent was suspicious, and 19.2 percent were positive on the initial test. Since the reaction in about 33 percent of suspicious animals (percentage varying according to status of disease in different herds, and with the intensity of the reaction of a given individual) grows stronger and ultimately becomes fully positive in the course of 2 or 3 months, a necessary loss is indicated of about 24 percent of the members of these herds in the process of eradication with the application of reasonably prompt measures. Partial reactions in the 1:100 and 1:200 dilutions are highly significant, and animals giving reactions however slight in these dilutions should be considered as probably or possibly infected, depending on whether or not they are in a herd known to be infected.

"No reason is seen for altering an earlier view expressed by us in 1918 that the proportion of confirmed reactors, those giving complete reactions over a period of several months, which change from positive to negative is too small to warrant an effort to salvage them at the cost of undue risk of reinfecting other animals. The idea has spread that infected cows will frequently fail to react in the parturition zone. We have observed no such phenomenon, and believe this to be a fallacy growing out of the fact that cows usually become infected during pregnancy, and especially when they calve prematurely agglutinins are not always fully established. In eradication we have found that a half dozen tests spaced at intervals of about a month are far more effective than the same number of tests spread over a year or more. The object should be to identify and remove the newly infected animal before it has an opportunity to spread the disease."

Bang disease control work in fourteen State institution herds.—II, Progress report to 1931, B. S. Fritz and M. F. Barnes (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 5, pp. 680–691*).—The further results obtained in bovine infectious abortion control work in Pennsylvania (E.S.R., 63, p. 773) have led to the following conclusions:

"Bang disease-free herds breed with a regular degree of frequency which is known not to occur in most infected herds. The elimination of Bang disease has brought about a high degree of satisfaction in the management of these herds. It has furnished a definite program of disease control for those responsible. It has insured a high state of breeding efficiency. It encourages and justifies efforts at herd improvement. It sets a higher standard of more economic production. It has eliminated the uncertainty of production. It also has furnished some insurance for a safe milk for the inhabitants of our institutions. It has reduced the danger of persons becoming infected with undulant fever through personal contact or by drinking raw milk from Bang disease-infected herds. The number of abortions experienced does not confirm statements frequently heard that a high abortion rate occurs in negative herds. These herds are examples in their communities of the advantages in establishing Bang disease-free herds."

Infectious bovine mastitis.—I, The bromthymol blue test in the diagnosis of mastitis, W. N. Plastridge and E. O. Anderson ([*Connecticut*] *Storrs Sta.*

Bul. 184 (1933), pp. 17, fig. 1).—In the authors' studies milk samples were collected from individual quarters of 80 cows at weekly intervals over a period of 16 months and examined by the following methods: Blood agar plate, broth culture, direct microscopic examination, quantitative determination of sediment content, and the bromothymol blue test. The efficacy of bromothymol blue in the detection of chronic cases of mastitis and shedders of streptococci commonly associated with mastitis was determined by comparing the color reactions with the results of the other tests employed.

"Disease-free quarters gave negative reactions to the bromothymol blue test consistently over the entire lactation period, with the exception of the first 20 days and the last 30 days of the lactation period. Quarters which would be classed as normal except for the shedding of weakly hemolytic, chain-forming streptococci seldom gave an abnormal color reaction to the bromothymol blue test during the greater part of the lactation period. However, abnormal color reactions persisted in many instances for more than 20 days following calving and reappeared 60 or more days previous to cessation of lactation.

"Quarters which yielded milk abnormal in appearance at rare intervals gave abnormal color reactions in less than 50 percent of the weekly tests. However, about 70 percent of the samples from quarters which gave thick, flaky, or discolored milk several times during the lactation period, excluding a short period following parturition and a period of 30 days previous to cessation of lactation, gave color reactions suggestive of mastitis.

"A comparison of the results obtained with the bromothymol blue test on pooled and quarter samples shows that pooling of samples from all four quarters greatly lessens the efficiency of the test. In general, the results presented indicate that the bromothymol blue test is of no value in detecting apparently healthy carriers of organisms commonly associated with mastitis, that it is of slight value in detecting mild cases of mastitis, and that it may be expected to give color reactions indicative of mastitis in about 70 percent of the tests when applied to samples from quarters which frequently give milk that is abnormal in appearance. A color chart to facilitate the interpretation of the color reactions given by the bromothymol blue test is described."

Necrobacillosis of the liver in a steer, A. N. McGregor (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 5, pp. 696, 697*).—This is a report of a case of necrobacillosis of the liver of a 3-year-old Holstein steer, in a fair state of nutrition, which was one of a carload of cattle transported by rail from a shipping point in North Dakota to Washington State.

Enzootic ataxia of lambs in Western Australia, H. W. Bennetts (*Aust. Vet. Jour., 9 (1933), No. 3, pp. 95–100*).—The experiments conducted have demonstrated that "lambs affected with early signs of enzootic ataxia can be successfully reared on cow's milk. Recent observations have confirmed the statement that lambs developing ataxia only when old enough to be weaned may be successfully reared on pasture if taken away from their mothers. Evidence is quoted in substantiation of the claims that the incidence of the disease is more severe in July and August, particularly when the rainfall is heavy during this period, and that lambs dropped late in the season are particularly susceptible. A detailed clinical description is given—acute, subacute, and chronic types of the disease are recognized. Degeneration of nerve fibers in the spinal cord, similar to that previously reported [E.S.R., 68, p. 817], was found to be constant in the further eight cases examined in 1932. The medulla oblongata, cerebellum, and nerves of the hind limb may be affected with degenerative processes. It appears that ataxia results from degeneration of nerve fibers, particularly in the spinal cord. The areas involved correspond chiefly with what in man are the long ascending tracts."

Botulism of sheep in Western Australia and its association with sarcophagia, H. W. Bennetts (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *6* (*1933*), *No. 3, pp. 137–144*).—The author reports that botulism of sheep, first recorded in Western Australia in 1928, has since increased progressively and is now recorded as a source of greater economic loss than all other diseases affecting sheep in Western Australia. It is said to be due to the ingestion of toxic rabbit carrion. "The high incidence in Western Australia, as compared with that recorded in other parts of Australia, is ascribed to the annual long dry period extending over many months. The great increase in the rabbit population, combined with the attempted destruction by poisoning, results in abundant carrion being available during this period when depravity of appetite is acute. It is suggested that the term 'sarcophagia' is appropriate for the condition described, and that further work should be undertaken to determine the actual cause and means of prevention of this condition. The clinical features of the disease are described. *B*[*acillus*] *parabotulinus* has been isolated from rabbit carrion."

Nutritional factors affecting resistance to haemonchosis, I. C. Ross and H. McL. Gordon (*Aust. Vet. Jour.*, *9* (*1933*), *No. 3, pp. 100–107, figs. 2*).—Observations have shown that "lambs which have almost completely thrown off heavy infection with *H*[*aemonchus*] *contortus* may remain markedly susceptible to infection, though it is known that often a marked resistance may follow a single heavy infection. Age or acquired resistance to *H. contortus* in old sheep may be completely broken down when they are fed on a diet markedly deficient in proteins and minerals, but it is possible that the deficiency must be of sufficient severity to be reflected in marked loss of body weight and condition. Some types of resistance to *H. contortus* are not affected by such nutritional conditions, and it is suggested that in such cases the resistance may be a natural (genetic) resistance rather than an acquired or age resistance."

A preliminary survey of the distribution of the hookworm of sheep in New South Wales, G. Kauzal and N. P. H. Graham (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *6* (*1933*), *No. 3, pp. 189, 190*).—As a result of an abattoir examination, 39 cases of infestation with *Monodontus trigonocephalus* were found out of a total of 456 sheep examined, or a percentage of 8.6. In general, it was found that the individual infestations were light but invariably accompanied by marked macroscopic lesions, mainly in the form of hemorrhage into the mucous membrane of the small intestine. While the average degree of infestation was 21.9 worms per sheep, in a few instances up to 100 worms were present.

Some observations on trichostrongylosis of young sheep, G. Edgar (*Aust. Vet. Jour.*, *9* (*1933*), *No. 4, pp. 149–154*).—The observations here reported show that the infestation of young sheep with the smaller trichostrongyles, particularly *Trichostrongylus* sp., is attended with very serious, and even fatal, results.

Studies of the nematode Oesophagostomum columbianum, T. E. Nichols (*Vet. Alumni Quart.* [*Ohio State Univ.*], *21* (*1933*), *No. 2, pp. 71–82*).—In studies of the nodular worm, the intestines of 1,182 sheep were examined for the presence of *O. columbianum* and to estimate the economic loss to the meat-packing industry.

Observations made at two packing houses indicate that 87.1 percent of the sheep in Ohio are infected, that the larger flocks are more heavily infected, and that as time advances the slight cases decrease in numbers and the marked cases increase. The percentage (62.6) of infection was much less at the plant where the small flocks are slaughtered as compared with that of 95.8 percent at the one where the larger flocks are slaughtered. The degree of infection was slight in most of the lambs of the smaller flocks, while it was marked in the larger flocks examined. The nodules first make their appearance as small opaque lesions, progressing to larger caseous lesions, and finally to those of calcareous character. As nodules appeared in the intestinal walls, so did lesions of like character appear in the livers.

Loss in casings due to nodules for the year 1932 in the plant where the small flocks are slaughtered was 44 percent, while that at the other plant was 100 percent. The monetary loss due to the nodular condition caused by *O. columbianum* for the year 1932 at the other plant was from $131.45 to $179.52 for the former plant and from $4,778.75 to $6,690.25 for the latter company. The monetary loss amounted to from 20 to 28 cents per lamb. Since the estimated number of lambs produced annually in Ohio is about 1,270,000, a loss of from $254,000 to $335,600 was realized in 1932.

The toxicity of Baileya multiradiata for sheep and goats, F. P. MATHEWS (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 5, pp. 673–679, figs. 2*).—In an investigation of sheep losses at the Texas Experiment Station Loco Weed Laboratory, conducted by the U.S.D.A. Bureau of Animal Industry and the station cooperating, *B. multiradiata* was proved to be toxic to both sheep and goats. The pathology and symptoms associated with this form of poisoning were of little assistance in rendering a diagnosis. The plant appears to constitute a danger to animals only under unfavorable range conditions.

Results in the use of fresh and oxalated blood of swine when making cellular counts and hemoglobin determinations, H. C. H. KERNKAMP (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 5, pp. 666–672, fig. 1*).—Work at the Minnesota Experiment Station has led the author to conclude that while it is possible to use a blood-oxalate mixture for making the various examinations included in a blood picture, the results are likely to give values that are significantly greater or less than the blood picture obtained from freshly drawn blood. These studies show that as the interval of time increases between the drawing of the blood and the making of the examinations, there is a tendency for the hemoglobin value and the relative percentage of lymphocytes to increase and the total number of red and white blood cells per centimeter and the relative percentage of polymorphonuclear leucocytes to decrease, yet there is no definite relationship to indicate whether these tendencies can be applied uniformly to any given sample of oxalated blood.

Recognition of the most important infectious disease of swine in the United States, F. BREED (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 5, pp. 656–665*).—This summary deals particularly with hog cholera, infectious enteritis (pig typhus), and swine erysipelas, presented in connection with a list of 12 references to the literature.

The use of Kendall's media in the study of hog cholera virus and Mycobacterium tuberculosis, S. H. HOLLOWAY (*Vet. Alumni Quart. [Ohio State Univ.], 21 (1933), No. 2, pp. 52–70*).—In work with the hog cholera virus the author was unable to demonstrate the growth of Mandler candle filtrate culture from the five virus samples studied, either aerobically or anaerobically. "We were unable to recover any bacterial forms from filtrate cultures in K media, under aerobic or anaerobic conditions. We were unable to demonstrate any growth in Seitz filtrate cultures from the virus sample studied. A description is offered of a streptococcus present in the blood of virus pigs at the acme of infection, this organism being filtrable through a positive gypsum candle but not through a Mandler type candle. The hypothesis is offered that hog cholera virus is an obligate parasite and needs a living susceptible host for its growth and proliferation."

In work with *M. tuberculosis* it was possible to cultivate the tubercle bacillus on Kendall's media. "The growth of the tubercle bacillus on Kendall's media is apparently favored by the addition of 5 percent glycerin. The nutritive factors contained in the intestinal tissue are for the most part dializable. It is tentatively suggested that the growth of B.C.G. on Kendall's media is associated with a difference in morphology and staining that may influence the virulence after prolonged subcultures."

Neurotropism of vesicular stomatitis virus, H. R. Cox and P. K. Olitsky (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 653, 654*).—The intracerebral inoculation experiments here reported show that such inoculation of guinea pigs with the virus of vesicular stomatitis of horses induces characteristic degenerative lesions in the organs of the central nervous system, and that after the virus had become fixed by several brain passages in guinea pigs it exhibits neurotropic reactions in white mice and rabbits.

Further studies on neurotropism of vesicular stomatitis virus, H. R. Cox and P. K. Olitsky (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 5, pp. 654, 655*).—In work conducted in continuation of that above noted, the neurotropism of the vesicular stomatitis virus has again been demonstrated and the white mouse shown to be suitable as a substitute for the guinea pig as an experimental animal.

Infection in mice following instillation of vesicular stomatitis virus, P. K. Olitsky, H. R. Cox, and J. T. Syverton (*Science, 77 (1933), No. 2008, pp. 611, 612*).—Further experiments (see above) show that the virus of vesicular stomatitis is strikingly active in a minute quantity (1:10,000,000 dilution) in the nasal passages of mice, and that the uninjured nasal mucosa is as sensitive to infection as is the injured brain or pads of animals. The experiments suggest that the closely related virus of foot-and-mouth disease may also be infective in high dilution through intranasal inhalation.

Cultivation of vesicular stomatitis virus, H. R. Cox, J. T. Syverton, and P. K. Olitsky (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 7, pp. 896–898*).—In cultivation work, Indiana and New Jersey strains of the vesicular stomatitis virus propagated for several years in guinea pig tissues (25 or more pad passages) were found capable of multiplication in vitro by the simple method here described, white mice providing a satisfactory means of titration.

Relationship of the viruses of vesicular stomatitis and of equine encephalomyelitis, J. T. Syverton, H. R. Cox, and P. K. Olitsky (*Science, 78 (1933), No. 2019, pp. 216, 217*).—In the inoculation experiments here briefly reported the viruses of equine encephalomyelitis and vesicular stomatitis were found to be similar in many but not all biological properties. Since the horse is the natural host for the two infectious agents it is suggested that they may be generally related, although not identical as cross-immunization does not occur.

Insect transmission experiments with herpesencephalitis virus, J. S. Simmons, R. A. Kelser, and V. H. Cornell (*Science, 78 (1933), No. 2020, pp. 243–246, fig. 1*).—This is a preliminary report of work under way which indicates that the viruses used have been transmitted by the yellow-fever mosquito. Further investigation, however, is required to furnish absolute proof.

Allergic reactions in dogs, P. W. Burns (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 5, pp. 627–634, figs. 2*).—The author here describes an intradermal method of testing dogs for food allergy, consisting in the use of a 1:250 dilution of the food extract in a glycerin-saline medium, that was worked out at College Station, Tex. Several clinical cases of reactors to certain foods and the symptoms of each are outlined.

Studies on canine distemper.—IV, Immunization of dogs by means of bacterial products, A. S. Schlingman (*Jour. Amer. Vet. Med. Assoc., 83 (1933),* *No. 5, pp. 604–616*).—This contribution is in continuation of those previously noted (E.S.R., 69, p. 111).

The bacteriology of spleens in the preparation of the Laidlaw-Dunkin canine distemper prophylactic, N. J. PYLE (*Jour. Amer. Vet. Med. Assoc., 83* (*1933*), *No. 5, pp. 618–625, figs. 2*).—In work at Pearl River, N.Y., a bacteriological examination of "146 spleens, taken from distemper-infected puppies late in the filtrable virus stage of the disease, at a time when the second rise in temperature reached a high level simultaneously with the appearance of the characteristic distemper conjunctivitis and rhinitis, resulted in the isolation of *Salmonella enteritidis* from 20 spleens and an unknown micrococcus and *Staphylococcus albus* from 1 spleen each. The remaining 124 spleens were bacteriologically sterile. A similar examination of 13 spleens from distemper-infected adult dogs showed 2 of them to contain *S. enteritidis,* while 21 spleens from distemper-infected ferrets all proved to be "sterile." In no instance was *Alcaligines bronchisepticus* isolated from any of 180 spleens examined.

"Suspensions of the sterile puppy and ferret spleens injected into puppies produced a typical canine distemper diphasic rise in temperature with characteristic attending clinical symptoms. These results, associated with the ability to pass the infective agent through Seitz filters, indicated that a filtrable virus was the etiological agent.

"Subcutaneous injections of *S. enteritidis* proved to be pathogenic for a group of 12 puppies. All cases developed large abscesses at the point of injection. Ten of the 12 test animals succumbed to the infection at intervals of 7 to 24 days after the injection. Autopsies showed evidences of septicemia, and the organism was recovered from the heart blood and spleen tissues. The temperature curves and clinical symptoms bore no resemblance to distemper. Injections of this organism into 6 ferrets produced local abscesses but did not prove fatal to any one of the group."

Successful artificial immunization of dogs against Taenia echinococcus, E. L. TURNER, D. A. BERBERIAN, and E. W. DENNIS (*Soc. Expt. Biol. and Med. Proc., 30* (*1933*), *No. 5, pp. 618, 619*).—The authors found it possible to induce a marked degree of resistance to *T. echinococcus* infestation in dogs, and that there was no appreciable difference in the efficacy of the two antigens that were used.

Protecting poultry from predacious birds, W. L. MCATEE (*U.S. Dept. Agr. Leaflet 96* (*1933*), *pp.* [*2*]+*6, figs. 7*).—A practical account of methods of protecting poultry against hawks and owls.

Studies on fowl paralysis—the relationship between intestinal parasitosis and fowl paralysis, H. P. HAMILTON and W. P. BLOUNT (*Natl. Poultry Jour., 2* (*1932*), *No. 4, pp. 150–154; abs. in Helminthol. Abs., 1* (*1933*), *No. 4, pp. 154, 155*).—An examination was made of 67 fowls which had definitely died of paralysis for the prevalence of coccidia, *Heterakis papillosa, Davainea proglottina,* and *Ascaris lineata.* None of these were present in all the cases, but coccidia were the most frequent and usually the dominant parasite in mixed infections.

Nicotin sulfate as a vermifuge for the removal of ascarids from poultry, W. L. BLEECKER and R. M. SMITH (*Jour. Amer. Vet. Med. Assoc., 83* (*1933*), *No. 5, pp. 645–655, fig. 1*).—In work at Fayetteville, Ark., "Pulvules No. 142 (Lilly) were used to treat a total of 32 birds, with an efficiency of about 72 percent, when combined with 15 grains of kamala. Avian nicotine-kamala tablets (Jen-Sal) were used to treat 12 birds, with an efficiency of 66.7 percent. Seven birds were treated twice, the second treatment following the first in 2 weeks, and parasites were voided following each treatment. One group of 15 White Leghorns received repeated treatments, and their gain in weight and egg production were compared with those of another group of comparable birds. It was found that repeated treatments were of no advantage in increasing egg production or in improving the health of the birds.

Black Leaf 40 combined with 15 grains of kamala was used to treat 135 birds, with an estimated efficiency of 65.7 percent. Under field conditions one group of Rhode Island Red pullets, which received five treatments with this combination, made slightly less growth but produced 15 eggs more per bird than a comparable group of birds which received one treatment only. Three of the treatments caused a marked reduction in the production of eggs, resulting in an uneven rate in egg production.

"Black Leaf Pellets were used to treat 44 birds, 24 of which were parasitized, with an efficiency of 82.1 percent when combined with 15 grains of kamala. Jen-Sal avian kamala-nicotine tablets were used to treat 12 experiment birds, with average efficiency of 66.7 percent. Seven birds were treated twice and parasites were voided following each treatment. In field tests, repeated treatments were of no more value than one treatment before the birds came into production.

"One commercial 'double-duty' capsule was administered to 19 parasitized birds, with not over 50 percent efficiency.

"These results would indicate that nicotine-containing vermifuges are effective in removing *Ascaris lineata* from fowls harboring this parasite and, when combined with kamala, are effective against tapeworms also. While Black Leaf Pellets gave slightly better results in our tests, this slight difference is probably not significant. While Black Leaf 40 appeared to be an effective vermifuge, its depressing action in producing birds and the fact that toxic symptoms follow its use in some birds make it of questionable value, and, therefore, it cannot be highly recommended."

The recovery of Salmonella pullorum from the feces of adult carriers of pullorum disease, R. E. Greaves, R. S. Dearstyne, and H. C. Gauger (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 6, pp. 441–445*).—In the course of investigations at the North Carolina Experiment Station, an organism with the true morphological, cultural, and biochemical characteristics of *S. pullorum* was isolated from the feces of 2 of 21 known carriers of pullorum disease. "The isolations recovered were from 1 bird of proved constant reaction to the test for pullorum disease and from 1 bird of proved intermittent reaction. The organisms isolated from the feces of these birds produced the disease when administered per os to proved negative adult birds, and one strain produced the disease in 3-day-old chicks when administered in the same way. Lytic factors that were sufficiently strong to prevent the recovery of *S. pullorum* from the fecal samples were repeatedly encountered."

Thirteenth annual report on eradication of pullorum disease in Massachusetts, 1932–33, H. Van Roekel et al. (*Massachusetts Sta. Control Ser. Bul. 68* (*1933*), *pp. 8*).—In the work with pullorum disease during the season of 1932–33 (E.S.R., 68, p. 821), there was a marked reduction in the number of flocks tested, from 455 flocks with 377,191 birds requiring 420,861 tests of which 0.90 percent were positive in 1931–32 to 335 flocks containing 296,098 birds requiring 300,714 tests of which 0.47 percent were positive.

"The fact that four counties show an increase in percentage of positive tests and the remaining counties a decrease demonstrates that persistent testing is the only effective means of establishing and maintaining disease-free flocks. The average percentage (0.47) of positive tests is the lowest attained in the testing history. Whether such a low percentage can be maintained depends largely upon the economic condition and attitude of the poultrymen."

The diseases of poultry, rabbits, and game and their post-mortem inspections, N. Dobson (*Jour. Roy. Sanit. Inst., 54 (1933), No. 4, pp. 204–210*).—A practical summary of information.

A pandemic of rabbit-pox, H. S. N. Greene (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 7, pp. 892–894*).—A brief report is given of an outbreak of a highly contagious disease which occurred in a breeding colony of 1,500 rabbits in December 1932, every animal in the colony having been infected within 30 days.

The disease is said to have resembled smallpox in man, being characterized by an elevation of temperature with a pocklike eruption of variable extent in the skin and mucous membranes and an incubation period of from 5 to 10 days. The course of the disease was variable, death frequently occurring within a few hours after the first signs of infection were noted or after a period of days or weeks. Many animals recovered after severe infection, visible lesions healing with the formation of scars. The mortality rate varied with breed, sex, age, and physiological status. Among animals under 2 weeks of age, the mortality approximated 100 percent, but the rate decreased with age until, in normal adults, the mean mortality was less than 20 percent. In certain breeds, as the Himalayan, there were no adult deaths, while in others, as the Belgian, the breeding stock was decimated. Abortions were frequent.

It was noted that during the terminal stages of the epidemic the severity of the infection diminished greatly, so that a large proportion of animals of the most susceptible age groups survived infections contracted at that time.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Pennsylvania Station], R. U. Blasingame, A. W. Clyde, C. O. Cromer, J. E. Nichols, and J. A. Sperry (*Pennsylvania Sta. Bul. 293 (1933), pp. 12–14, fig. 1*).—The progress results are briefly reported of investigations on corn and potato production with mechanical power, mechanical hay driers, electrically heated milk utensil sterilizers and the ensilage harvester method of filling silos.

Geology and ground-water resources of the Roswell artesian basin, New Mexico, A. G. Fiedler and S. S. Nye (*U.S. Geol. Survey, Water-Supply Paper 639 (1933), pp. XII+372, pls. 46, figs. 37*).—This report, prepared in cooperation with the New Mexico State engineer and Chaves and Eddy Counties, presents the results of an investigation covering a period of three years made to determine the available supply of artesian and other ground water within the area.

Originally the area of artesian flow comprised 663 sq. miles, but largely on account of heavy draft upon the artesian reservoir it decreased to 499 sq. miles in 1916 and to 425 sq. miles in 1925. The area irrigated by water derived directly or indirectly from the reservoir amounts to about 60,000 acres. The annual quantity of water derived from wells is about 200,000 acre-ft., and the total discharge at the surface from all sources is about 250,000 acre-ft.

The investigation leads to the conclusion that no new land should be placed under irrigation with artesian water, but that the development of shallow ground water should be encouraged. The present decline of the artesian head is slight in comparison with that in earlier years, and there is ample evidence to show that the reservoir annually receives large quantities of recharge and that with proper conservation it will never be completely exhausted.

The silt load of Texas streams, O. A. Faris (*U.S. Dept. Agr., Tech. Bul. 382 (1933), pp. 71, pls. 2, figs. 12*).—This is the first progress report of investigations on the silt load of Texas streams which were conducted in cooperation with the Texas Board of Water Engineers. The Brazos River Basin was selected as a drainage area typical in its various sections of conditions prevailing on other drainage areas. Sampling stations were established at gaging stations, either near favorable reservoir sites or below areas comparable to other drainage basins.

It was found that the mean percentage of silt by weight in samples taken at six tenths of the depths in verticals at one sixth, one half, and five sixths the width very closely approximates the mean silt percentage for the section.

While it is known that steep mountain streams transport considerable coarse material by rolling it along the stream bed, it is believed that the solids conveyed by the streams studied at the sections under consideration are held in suspension and subject to sampling at velocities existing during periods when silt is being transported in significant quantities.

There was no evidence at the river stations under consideration of any direct relation between the suspended load and the velocity of the water. The higher the velocity the greater is the capacity to carry, but since the capacity load is not even approximately approached, the magnitude of the silt charge becomes in effect a function of loading rather than of capacity to carry. The greater part of the silt load of a stream is due to previous weathering.

The maximum silt percentage by weight occurs prior to the maximum stream discharge. There are two distinct peaks in the silt percentage curves for each flood. The first peak occurs on a rising stage at a point above which the volume of water increases much faster than the available silt load, resulting in dilution. The second peak occurs on a falling stage and is due to the caving of banks and the sloughing into the channel of material deposited on the slopes at higher stream stages.

The greater part of the suspended silt load of streams and of most of the material deposited in reservoirs is of such fineness that it will pass a Tyler Standard No. 300 sieve.

After 7 days' settlement, the average ratio of the percentage of silt by volume to the percentage by weight is 33:1. The mud column of samples kept in tubes for 7 days is comparable to freshly deposited material in reservoirs, but being taken from suspension it contains a mixture of different sized grains, while material deposited in reservoirs has been subjected to more complete sorting.

Suspended silt settles to the reservoir bottom soon after entering the slack water and, having a greater specific gravity than water, flows in the form of liquid mud down the slopes into depressions and along the main channel until blocked by the dam.

Owing to its greater density, silt-charged water entering a reservoir partly filled with clear water does not mingle with the clear, but forces it downstream toward the dam. No suspended silt is carried through the reservoir and over the spillway until all of the clear water has been discharged.

Silt deposited from suspension in reservoirs and kept continually submerged contains from 18.7 to 37 lb. of dry material per cubic foot of deposit. The average weight of the dry material per cubic foot of deposit in reservoirs in which a practically constant head is maintained approaches 30 lb.; in reservoirs that are emptied occasionally ultimately approaches 70 lb.; and in reservoirs used exclusively for flood control and therefore standing empty most of the time approaches 90 lb. Seventy pounds was selected as the average ultimate weight of the dry material per cubic foot of deposit in reservoirs where the deposits are subjected to alternate wetting and drying.

The greater part of the silt deposited from suspension in reservoirs and kept continually submerged has an angle of repose approaching 0°.

The specific gravity of dried silt from reservoir deposits is generally about 2.65. Samples taken from suspension and from which vegetable matter was excluded had an average specific gravity of 2.73.

Excess water held in silt by virtue of the structure of the deposit is not available as storage water. On exposure of such deposits to the air, the water is liberated so slowly that all of it is evaporated. Although the moisture content of exposed silt deposit increases when resubmergence occurs, silt that is not actually secured and agitated by incoming floods until complete separation of the particles takes place does not occupy as much space as when it was deposited. Each subsequent exposure and submersion results in a greater degree of consolidation.

The density of silt deposited in reservoirs is not increased by the depth of water on its surface. Actual tests of material submerged from only a few to over 100 ft. indicate no difference in density. Since the individual silt particles are completely surrounded with water the resultant pressure is 0.

The best method of preventing the deposition of silt in reservoirs is to keep it from being carried into the supply streams.

A list of 24 references to the works of others bearing on the subject is cited, and an appendix is included giving data on silt carried by various Texas streams based on discharge records of the U.S. Geological Survey.

The discharge of drains serving irrigated lands, L. T. Jessup (*U.S. Dept. Agr., Bur. Agr. Engin., 1933, pp. [2]+65+[1], fig. 1*).—Data relative to the maximum discharge of several drainage systems serving irrigated lands in 13 Western States are presented and discussed.

These projects have an aggregate gross area of approximately 2,850 sq. miles, of which 2,100 sq. miles are irrigated. They contain a total of 2,550 miles of drain and 230 drainage wells. Data are also presented on the total annual run-off from a gross area of 1,642,000 acres, of which 1,214,000 acres are irrigated. For most of this latter area the relation between annual run-off and total water applied is shown.

A summary giving total area and miles of drain for the various districts considered and weighted averages for all other factors showed that for a group of districts having an aggregate irrigated area of 1,113,646 acres the annual drain yield is 30.9 percent of the total water applied, and that 74.2 percent of the annual yield is carried during the period from April to October, inclusive. It shows also that the annual yield is 1.84 acre-ft. per acre, that the main irrigation system losses are 1.94 acre-ft. per acre, that the sum of the water delivered to the land and precipitation is 4.01 acre-ft. per acre, and that the difference between total water applied and drainage yield is 4.11 acre-ft. per acre.

Data on the maximum monthly rate of drain yield per square mile of tributary irrigated area and per linear mile of drain for each class of formation considered show that the range of limits for each class is wide, partly because of difficulties of classification and of variation in permeability, but to a large extent because of variation in many other factors that influence the rate of yield.

Plan of rehabilitation for Little River Drainage District, southeastern Missouri, L. A. Jones, W. A. Hutchins, and G. R. Shier (*U.S. Dept. Agr., Bur. Agr. Engin., 1933, pp. 40, map 1*).—The plan is outlined in detail. It recommends that no change be made in the legally fixed assessments for payments of the district's bonds and interest, but that for 1933 and subsequently the bondholders accept as payment in full each year the amount that the lands can pay. In determining the capacity of the land to pay, it is pointed out that with from 80 to 95 percent of the tillable land in the district farmed by tenants it is feasible to use the landlord's share as the measure of capacity to pay charges against the lands. This rental, if accurately determined, can be properly applied to all tillable land in the district, as it represents the entire rental obtained by the landlord and is the source from which his fixed charges of taxes and interest and his management and upkeep expenses must be paid.

The total capacity of the district to pay in any year, according to this method, is the cash value of one fourth of all the seed cotton produced that year, plus one half of all the loose hay, plus one third of all other crops, plus all pasture rentals. "Privilege rent", which is included in some of the pasture rentals, represents income from the land and therefore may properly be included in determining the capacity to pay.

The work is in cooperation with the University of Missouri.

Evaporation from reservoir surfaces, R. Follansbee (*Amer. Soc. Civ. Engin. Proc., 59 (1933), No. 2, pp. 254–265*).—This paper, a contribution from the U.S. Geological Survey, contains the results of all available evaporation records, not only in the United States and outlying possessions but also in foreign countries, reduced to reservoir surface evaporation by means of coefficients which are stated for each record. These results are given in summarized form, together with records of temperature, wind velocity, and relative humidity, so far as available. A total of 210 evaporation records are presented.

After the summary, the relative effect of temperature, wind velocity, and relative humidity is shown by comparison between pairs of records in which two factors are the same and the third is widely different.

A brief discussion of the variation in evaporation throughout the United States concludes the paper.

Standard equipment for evaporation stations (*Amer. Soc. Civ. Engin. Proc., 59 (1933), No. 2, pp. 266–268*).—The recommendations of the Special Committee on Irrigation Hydraulics of the American Society of Civil Engineers regarding standard equipment at evaporation stations, operated primarily to determine the evaporation from large water surfaces in the immediate neighborhood, are presented.

Evaporation from different types of pans, C. Rohwer (*Amer. Soc. Civ. Engin. Proc., 59 (1933), No. 2, pp. 223–253, figs. 8*).—In a contribution from the Colorado Experiment Station, a summary of the results of the available records where a comparison has been made between the evaporation from different types of pans or between the evaporation from a pan and a large water surface under similar conditions is given, together with recommendations as to the best types of pan to use under different conditions and the procedure to be followed in taking the observations.

The data show that records from floating pans are not as consistent or reliable as land pan records, nor is the evaporation from a floating pan any nearer the evaporation from a large water surface than that from a sunken pan of the same size and shape.

Comparisons between the evaporation from class A land pans of the Weather Bureau (type 1) and Colorado sunken pans with the evaporation from large water surfaces indicate that there is a definite relation between the pan and the reservoir evaporation. For the class A land pan the factor for computing the reservoir evaporation from the pan evaporation is between 0.69 and 0.70, and for the Colorado pan it is 0.78. Comparison of the evaporation from different types of pans with that from large water surfaces of different sizes shows that the size of the pan has a proportionately smaller effect on the evaporation as the size of the surface increases, and that when the diameter is greater than 12 ft. the size of the pan has practically no effect on the evaporation.

When all factors are considered pan 1 is probably better suited for evaporation investigations than the other evaporation pans. In order to obtain comparable evaporation results standard equipment installed under representative conditions should be used, and a standard procedure should be followed in making the observations.

An appendix summarizes data on evaporation from water surfaces.

Reservoirs for farm use, M. R. Lewis (*U.S. Dept. Agr., Farmers' Bul. 1703* (*1933*), *pp. II+17, figs. 10*).—This supersedes Farmers' Bulletin 828 (E.S.R., 38, p. 84). It describes the construction and maintenance of farm reservoirs to be used for the storage of comparatively small quantities of water.

Costs of clearing land on Minnesota farms, M. J. Thompson, L. H. Schoenleber, and N. A. Kessler (*Minnesota Sta. Bul. 299* (*1933*), *pp. 28, figs. 8*).—This bulletin reports the results of an analysis of the costs of reclaiming stump and stone lands in northeastern Minnesota, conducted in cooperation with the U.S.D.A. Bureau of Agricultural Engineering. The data relate to 122 farms in 11 counties and cover the clearing of 371 acres of stumps and stones. The data also relate to sand, sandy loam, clay loam, and clay soils. A distinctive forest cover was associated with each soil type.

Brushing was done on 194 acres and 66 farms. The time required per acre varied from 1 day on clay to nearly 5 days on sandy loam. The average was 3 days. This covers burning as well.

Stumping was done on 320 acres and 104 farms. Man labor ranged from less than 3 days on sandy soil to 5¾ days on clay with the mean 4 days (42 hours). Horse labor required was 2¾ days per acre. Stumping covers four subdivisions of labor: Blasting, pulling, piling, and burning. The 42 hours stumping time may be apportioned thus: Blasting 10 hours, or one fourth the time; pulling 1½ days, or one third the time; piling 13 hours, or less than one third the time; and burning 5 hours, or nearly one eighth the time.

Sandy soil took the least explosive, and clay took the most. The average acre required 127 sticks of explosive, 84 feet of fuse, and 60 caps. The diameter of blasted stumps was as follows: On sandy soil 9.2 in., on sandy loam 11.1 in., on clay loam 13.2 in., and on clay 14.6 in.

Breaking, including disking and seed bed preparation, was done on 221 acres and 76 farms. Horse labor was used in all cases. Breaking was done most rapidly on sandy soil and most slowly on stony clay loam. The average acre took exactly two days to break for man and team. Eighty acres of land were stoned. This required more than one 10-hour day for the average acre. Clay was even freer of stones than jack pine sand. Roots were picked off 166 acres. The job took just a fraction over one half day of man labor per acre. The picking was lightest on clay soils which grew the largest stumps. Stump hole filling and associated trimming jobs took over a day per acre.

The 12 days of man labor were distributed thus: Brushing 3 days, stumping 4 days, breaking-disking 2 days, picking stones and roots nearly 2 days, and miscellaneous 1½ days. To clear an acre of sandy land required 7¾ days, of clay 9¾, of sandy loam 12, and of clay loam 15 days. The amount of material used per acre varied in the following order: Sand least, sandy loam, clay loam, and clay. Breaking was the big job for horses. Other jobs in declining order were: Stumping, stoning and picking roots, and miscellaneous.

Light soils were cleared at a lower cost than heavy soils.

Brief instructions on methods of gully control, C. E. Ramser (*U.S. Dept. Agr., Bur. Agr. Engin., 1933, pp. 36, figs. 19*).—Technical data on gully control are given to supplement that presented in Farmers' Bulletin 1234 (E.S.R., 47, p. 19). Detailed drawings of check dams are given, and curves are included for use in the determination of the sizes of culverts through soil-saving dams, and tables for determining the sizes of notches and spillways in check and large soil-saving dams.

Public Roads, [October 1933] (*U.S. Dept. Agr., Public Roads, 14 (1933), No. 8, pp. 129–156+[2], figs. 29*).—This number of this periodical contains the current status of national recovery road construction as of September 30, 1933, and an article on The Effect of Vibration and Delayed Finishing on the Quality of Pavement Slabs, by F. H. Jackson and W. F. Kellermann.

Standards Yearbook, 1933 (*U.S. Dept. Com., Bur. Standards Misc. Pub. 139 (1933), pp. V+255*).—This is the seventh issue of this yearbook. It contains outlines of the standardization activities and accomplishments of the Bureau of Standards and other agencies of the Federal Government and of States and counties and also those of national technical societies and trade associations.

Retaining-wall design (*Pub. Works, 64 (1933), No. 8, pp. 33, 34, figs. 4*).—Basic elements in the design of retaining walls are presented.

Wood-beam design method promises economies, J. A. Newlin, G. E. Heck, and H. W. March (*Engin. News-Rec., 110 (1933), No. 19, pp. 594–596, figs. 4*).—In a contribution from the U.S.D.A. Forest Service, a new design method for calculating the horizontal shear in wooden beams is described. It assumes that because of the shear distortion in the vicinity of the base of checks or fissures that are present in all beams, the upper and lower halves of the beam act to some extent as independent beams. The result is to relieve the mean shearing stress in the neutral plane. An attempt is made to explain the elastic behavior of a checked beam under load and thus to explain the discrepancy existing between the facts of experience and the predictions of the usual methods of calculating shear. The background for this explanation is furnished by an approximate mathematical analysis of the problem combined with the results of a series of about 200 tests, in which the loads causing shearing failure were observed on built-up artificially checked beams varying from 0.75 to 1.5 in. to 8 by 16 in. in cross-section and with varying amounts of checking. On the basis of the theory and the results of tests, practical directions are given for the more realistic calculation of loads that will cause shearing failure.

It was found that for checked beams with a span-depth ratio of 9:1 the point of application of the minimum concentrated load causing failure by shear is at a distance from the support approximately three times the height of the beam. The distance of the critical point from the support is somewhat greater for longer spans and somewhat less for shorter spans, but in any case for loads applied at three times the height of the beam from the support the 2-beam portion of the reaction at the nearer support is approximately one sixth.

Developments in reinforced brick masonry, J. H. Hansen (*Amer. Soc. Civ. Engin. Proc., 59 (1933), No. 3, pp. 407–427, figs. 4*).—This paper contains a brief history of the development of reinforced brick masonry to the time that engineers in the United States became interested in the subject. Its development in this country is then given in detail by analysis of tests.

The author concludes, in view of the available evidence, that the assumptions accepted in the design of reinforced concrete structures can be used in the design of reinforced brick masonry items similar to those discussed. The recommended working stress of 0.4 f_c' given by the Joint Committee on Standard Specifications for Reinforced Concrete can be safely allowed on reinforced brick masonry. This would allow approximately 750 lb. for cement mortar-brick masonry and 500 lb. when cement-lime mortar is used, based on tests of full-sized wall panels.

The use of smaller bars (0.5 in. round) is more feasible and will result in higher bond strength. Bond stresses should be limited to 80 lb. per square inch. Shear stresses should be limited to from 25 to 30 lb. per square inch, which would necessitate stirrups or bent-up bars in most beams. To develop maximum strength the reinforcing rods should be placed in vertical joints. The face of the brick that develops the greatest compressive strength should be placed normal to the line of compressive stress in the beam. The value of the ratio $\frac{E_s}{E_b}$ is somewhere between 20 and 30. The mortar should consist of 1 part cement, 0.25 part lime, and 3 parts sand, by volume. Builders should adhere rigidly to all the requirements of good brick masonry, that is, the proper wetting of the brick and complete filling of joints.

Tests of riveted and welded steel columns, W. A. SLATER and M. O. FULLER (*Amer. Soc. Civ. Engin. Proc., 58 (1932), No. 7, pp. 1147–1180, figs. 22*).—Tests conducted at Lehigh University are reported which were undertaken to secure a comparison of the behavior and strength of built-up steel columns fabricated by riveting with similar columns fabricated by welding. The program included 9 columns, of which 2 were riveted and 7 were welded. In 4 of the welded columns the welding was continuous throughout the length. In the other 3 welded columns intermittent or stitch welding was used. The lengths to the nearest inch were 19 ft. 8 in. for 3 of the columns, 16 ft. 6 in. for 2, 15 ft. 5 in. for 3, and 5 ft. 6 in. for 1.

The columns were built up by riveting or welding cover plates to the H-section or the I-section which formed the core. The total cross sectional area ranged from 14.26 to 24.3 sq. in. in different columns. All were tested as flat-ended columns. Observations included measurement of strains, slip of plates, deflection of column due to the applied load, and strains caused by plastic flow of the heated metal and by the stress set up when the heated metal cooled. In general, the strains were measured in various positions in cross sections at the top, middle, and bottom of the column. A special feature was the testing of the column having an excessive initial curvature for comparison of strength, bending moment, and deflection, with those of a similar straight column.

The largest slipping of plates observed was about 0.01 in. No weaknesses attributable to slipping of plates developed. Stitch welding caused shortening of the metal at sections through the welds and elongation at the edges of the cover plates at sections midway between welds.

The points of first appearance of strain lines corresponded in position to the points of highest stress due to heating of the metal, insofar as the stress due to heating could be determined. The average modulus of elasticity determined from the coupon tests was 29,300,000 lb. per square inch, and that determined in the tests of the columns was 28,650,000 lb. per square inch. The modulus used in computing stress from strain was 29,000,000 lb. per square inch. In all comparable cases the deflections were greatest for the continuously welded columns. There was little distinction as to deflection between the riveted and the stitch-welded columns. In general, the magnitude of the deflection corresponded to the magnitude of the initial departures from straightness. Nothing in the tests indicated any marked advantage of either riveted or welded columns over the other as far as freedom from bending moments is concerned, although the continuously welded columns seemed to be more subject than the others to initial deflection.

The ratios of the stress at maximum load to the yield-point stress determined from the coupons were so nearly equal for all the columns tested that no reliable distinction can be made between the merits of riveting or welding columns, either with a continuous or an intermittent weld. Although the tests indicated the presence of initial stresses of considerable magnitude, introduced in the cooling after welding and probably after rolling also, the maximum loads carried did not appear to be appreciably influenced thereby.

Mechanical joints for cast iron pipe, H. R. Cook (*Pub. Works, 64 (1933), No. 8, pp. 25–28, figs. 5*).—Technical information is given on the advantages of mechanical joints and on the conditions for which they are adapted. Descriptions of several types of such joints are given.

Testing riveted joints of cromansil steel, I. Lyse (*Engin. News-Rec., 110 (1933), No. 19, pp. 584, 585, figs. 4*).—Investigations conducted at Lehigh University of riveted joints of cromansil steel are briefly reported. This is a low-alloy steel developed for structural purposes containing from 0.40 to 0.60 chromium, 1.10 to 1.40 manganese, 0.70 to 0.80 silicon, and carbon to suit. A carbon of 0.20 provides a steel workable in the " as rolled " state, with yield-point strength of about 56,000, ultimate tensile strength of about 87,000, and shearing strength of about 65,000 lb. per square inch.

Two butt joints and two lap joints were tested, using plates and rivets of chromansil steel. The joints were riveted by air hammer and hydraulic pressure. The difference in method of riveting is shown to have a marked effect upon the load at which the first slip occurred. For the butt joint the hydraulic riveting produced more than 2.5 times greater stress at time of slip than did air-hammer riveting. For the lap joint the corresponding value was about 1.25. Since the butt joint failed in the main plate, the ultimate strength was not affected by the method of riveting. The lap joint, however, showed an increase in strength of about 18 percent by the use of hydraulic pressure, and the failure occurred through the rivets.

The stress at which the plate in the butt joints failed was about 106,000 lb. per square inch when based on net plate section. The crushing stress at failure was 104,000 lb. per square inch, or nearly as great as the ultimate tensile stress. The lap joints developed ultimate stress in single shear of 67,000 lb. per square inch for air hammer and 78,200 lb. per square inch for hydraulic riveting.

Applying viscosity index to solution of lubricating problems, G. H. B. Davis, M. Lapeyrouse, and E. W. Dean (*Oil and Gas Jour., 30 (1932), No. 46, pp. 92, 93, 169, figs. 5*).—In this article a compilation of the more useful data and charts on viscosity index is given. A discussion of the application of viscosity index to lubricating problems is also included. In this it is indicated that the viscosity index of an oil has a direct bearing on (1) ease of cold weather starting and (2) oil consumption in the engine.

Effect of increasing octane number on motor fuel performance, W. V. Hanley (*Natl. Petrol. News, 24 (1932), No. 38, pp. 27–32, figs. 4*).—Studies conducted at Oregon State College are reported, the results of which indicate that for any particular motor and operating conditions there is a definite octane number of fuel required for best performance, and that a loss of power will result above as well as below this value.

It is concluded that the most economical condition of operation would be obtained when using a fuel of high enough octane number to just remove detonation under the most severe conditions of operation that will be encountered with a particular motor, but no higher.

Results from alcohol-gasoline fuel blends, H. Miller (*Agr. Engin., 14 (1933), No. 10, pp. 274–276, 278, figs. 4*).—In a contribution from the Idaho Experiment Station, the results of studies conducted at the station and elsewhere are presented, indicating in general a favorable attitude toward the use of alcohol-gasoline blends as fuels for internal-combustion engines.

The lubrication difficulty encountered when using 95 percent ethyl alcohol in blends with gasoline was corrected by the use of 0.5 percent of oleic acid in the blend. Tests were made of (1) blending absolute alcohol with gasoline, (2) blending commercial alcohol with gasoline through the use of blending agents, and (3) using a double bowl carburetor and two fuel tanks, one containing commercial ethyl alcohol.

A mixture containing 10 percent of absolute alcohol was tested on a grade, with a variation in altitude of about 2,000 ft. between the points where the tests were made, a distance of 7.8 miles. The consumption was 1,950 cc compared with 2,050 cc for regular gasoline and 1,910 cc for premium gasoline. The antiknock properties of the blend were between that of the regular gasoline and the premium gasoline of the same brand. On the basis of this test, 47 percent more could be paid for alcohol over gasoline.

A blend made up of commercial alcohol, blending agents, and gasoline had the advantage of better antiknock properties over a blend of absolute alcohol and gasoline, due to the water content of the alcohol. The performance of this blend with a 5.5:1 compression ratio gave mileage 6.6 percent better than premium gasoline, even when made up from third structure gasoline, and 26.9 percent better than ordinary gasoline.

The method of using alcohol by the use of a double-bowl carburetor is the easiest to put into practice. With proper mixing, performance equal to that of blends may be obtained. The handling of two fuels on tractors was found to be not objectionable. Ten percent commercial alcohol burned with ordinary gasoline resulted in performance equal to or better than premium gasoline.

Gasoline and alcohol, G. McIntyre (*Canad. Chem. and Metall., 17 (1933), No. 9, pp. 184–187*).—Characteristics of gasoline and their significance relative to use in automobile engines are discussed, together with some technical aspects of the use of alcohol-gasoline blends.

It is concluded that from an engine-operating point of view, gasoline-alcohol blends are feasible, providing consideration is given to the fact that if the same economy is required for blends as for gasoline a lower performance must be expected, and conversely, if the same performance is expected a higher consumption of fuel is inevitable.

As regards the stability of blends, it may be possible to store blends of gasoline and alcohol of high alcohol concentrations in parts of the country where extremely low temperatures are not met with. If blending agents such as benzol, butyl alcohol, etc., are used, it may be possible to obtain blends which will be tolerable to cold and to water in practicable proportions.

Prospectus on rural electrification in the Tennessee River Basin, G. W. Kable (*U.S. Dept. Agr., Bur. Agr. Engin., 1933, pp. 45, pls. 3*).—The purpose of this prospectus is to present a basis for formulating a practical program of research and development in the use of electricity on farms and in rural districts in the Tennessee River Basin.

Available data bearing upon the present and probable future development of agriculture in the basin are summarized, the progress made in the use of electricity on farms and in rural districts in the United States and other countries is outlined, the elements that must be considered in setting up a program of rural electrification in the valley are discussed, and a program of action is tentatively suggested.

The program of rural electrification for the basin includes features on policy, distribution plans, design of distribution lines, rural rates for electricity, farm and residence wiring, financing, utilization of electricity on the farm and in supplemental industries and research therein, and cooperation.

Two appendixes summarize data on the use of electricity on farms in the Tennessee River Basin and on rural rates for electric power in the basin and in surrounding territory.

A method of generating electricity as a greenhouse by-product, A. H. Senner (*Rural Electrif. and Electro-Farming, 9 (1933), No. 100, pp. 114–116, fig. 1*).—In a brief contribution from the U.S.D.A. Bureau of Agricultural Engineering, a description is given of a scheme for producing electricity as a by-product of greenhouse operation. It consists primarily in raising the pressure of the steam-heating boiler above that required for heating, utilizing the steam for operating a turbine and the exhaust for heating.

Data are presented to show that the total heat of steam at the various pressures above 14.7 lb. per square inch absolute atmospheric pressure increases only a little more than 5 percent even at 500 lb. absolute, but the temperature on the Fahrenheit scale more than doubles. The back pressure turbine is considered to be the simplest means of obtaining byproduct power from exhaust steam. A cost analysis is presented indicating that current can be generated in such a plant at a cost of 0.18d. per kilowatt-hour.

Electric soil heating, 1933 studies, G. W. Kable and A. V. Krewatch (*[C.R.E.A.] Natl. Rural Elect. Proj., College Park, Md., Rpt. 8 (1933), pp. 16, figs. 18*).—The results of studies of surface heating supplemented with check tests on cinder insulation and wind effects are reported, together with the results of a new series of studies on insulation, mats, glazing materials, double glazing, ground slopes, and thermostats (E.S.R., 67, p. 329).

Surface heating resulted in saving as much as 40 percent of the power used by cables placed at a depth of 6 in. On cold nights, temperatures were from 5° to 8° F. higher with the same thermostat setting. Seeds germinated quicker, plants grew faster, were sturdy, and had larger root systems. Plants grew in contact with the heating cables without apparent injury, and the cables did not interfere with growth or harvesting except in sweetpotato beds. A portable knockdown bed, consisting of a frame made of 1 by 12 in. boards placed on the soil surface and without insulation or banking, gave good results with surface heat in freezing weather.

Complete cinder insulation saved 19 percent of the power over shallow bank insulation, and 12 percent of the power over a bed with side insulation to a depth of 14 in. below the bed soil. Double glazing reduced the power consumed from 20 to 45 percent. Glass substitute-covered beds used more power than single glass-covered beds. Straw mattresses saved from 24 to 42 percent of the power on nights varying in temperature from 13° to 30°. Sloping ground in beds resulted in from 1° to 13° difference in air temperatures between upper and lower sides of the bed. Wind losses may be serious in unprotected beds. Thermostats should be set for "on" position to hold correct minimum temperatures and to save power.

Electric lights for supplying biologically effective ultra-violet light, A. R. Winter and I. P. Blauser (*Agr. Engin., 14 (1933), No. 10, pp. 277, 278*).—Studies conducted at the Ohio Experiment Station are reported in which biological tests were made with Mazda 60-w CX lamps, G-1 60-w lamps, and G-5 100-w lamps.

It was found that Mazda CX 60-w lamps produce appreciable quantities of biologically effective ultraviolet light. The use of one of these bulbs in each compartment of a battery brooder, without a reflector, 11 hours or more daily will supply an adequate amount of the vitamin D factor.

G-1 and G-5 glow lamps produce biologically effective ultraviolet light. Chickens exposed 4 hours daily to a 50-w G-1 lamp with aluminum reflector, at a distance varying from 1 to 4 ft., were protected against rickets. Chickens exposed 4 hours daily to a 100-w G-5 glow lamp with an aluminum reflector, at a distance of 4 ft., were protected against rickets, and exposure for 1 hour daily afforded nearly complete protection.

* **Procedure for making draft tests of plows, directions for making square yard harvests of legumes, and description and use of soil sampling tube** (*U.S. Dept. Agr., Bur. Agr. Engin., 1933, pp. 17+[4], figs. 3*).—Suggestions for making draft tests of plows and plowing equipment are given which are the outgrowth of a series of conferences held in Ohio during 1932 between members of the staff of the division of mechanical equipment, U.S.D.A. Bureau of Agricultural Engineering and of the departments of agricultural engineering, agronomy, and district and county experiment farms of the Ohio Experiment Station. The method of procedure was developed in an effort to make possible the correlation of the data obtained in draft tests at different locations and by different individuals in the State. The procedure involves both field and laboratory observations, including in the latter particularly the determination of the plasticity characteristics. The list of references omits the reports of much work done on this subject at the Alabama Experiment Station.

Directions also are given for making square yard harvests of legumes, and a soil sampling tube is described and illustrated which has been found convenient for rough sampling for moisture and apparent specific gravity determinations. The tube was developed by the Bureau of Agricultural Engineering.

The heating of cotton when bulked and its effect on seed and lint, H. P. Smith, M. H. Byrom, D. T. Killough, and D. L. Jones (*Agr. Engin., 14* (*1933*), *No. 10, pp. 280–284, figs. 7*).—Studies conducted at the Texas Experiment Station are reported which showed that the stage of maturity of the seed and lint rather than the use of machinery in harvesting is the main factor in causing cotton to heat when bulked in large piles in the field.

In harvesting cotton mechanically, the cotton should be dry and practically free of green leaves and green unopen bolls, and in order to avoid damage the cotton should not be placed directly on damp ground for any great length of time prior to ginning.

Mid-west farm building plan service (*1933, pp. 94, figs. 112*).—This catalogue contains descriptions of a large number of farm building and equipment plans which have been prepared cooperatively by 15 midwestern agricultural colleges. It represents a cooperative attempt by these institutions to build up a series of plans for farm buildings which are carefully designed and well detailed. The catalogue is descriptive only.

Ventilation of dairy barns in Quebec, L. G. Heimpel (*Sci. Agr., 13* (*1933*), *No. 8, pp. 528–539, figs. 4*).—A comparative study of 14 barns having seven each of two types of ventilation systems is reported in a contribution from Macdonald College of Quebec. The purposes of the study were (1) to discover and measure any differences in effectiveness and operation between the King and Rutherford types of ventilation systems, and (2) to collect data needed in the improvement of construction of dairy barns and their ventilation systems.

Observations were made of outtake air velocities, relative humidity, temperatures, and wind velocities. The data indicate that both the King and Rutherford types of ventilation are effective in bringing about a sufficiently rapid rate of air change to produce good stable conditions. Stable conditions which must be described as good and mediocre can be found among both types of installations, but in cases of failure or partial failure the cause is usually one of the following conditions or a combination of two or more of them: (1) Insufficient flue capacity, (2) too high a cubic content per animal unit or understocking of the stable, (3) lack of insulation in walls and ceilings to permit maintaining of the necessary temperature difference for good stable conditions in cold weather, and (4) air leakage through walls and ceilings and failure to equip the stable with double doors and windows.

It was found that outtake facilities can be concentrated to good advantage in a single flue. This is true even for exceptionally large stables. Under normal winter weather conditions, a rate of air change of 50 cu. ft. per minute per animal unit (1,000 lb. live weight) is sufficient.

The circulation of stable air is caused by the animals in it rather than by the ventilation system. Convection currents are stronger than the pull of the outtake flue, excepting within a radius of about 2.5 ft. from the mouth of the flue. Rows of stanchioned cattle set up very definite and strong convection currents from animal to ceiling, to the nearest cold wall, to the floor, thence back to the animal. There is also present in litter alleys and feed alleys of considerable length another current lengthwise of the passage way in one direction along the floor and in the opposite direction along the ceiling.

Circulation in parts of stables given over to box stalls is usually much inferior to that among stanchioned stock. These sections of stables are usually colder and often give indications of sluggish air circulation. The remedy would appear to be to keep such sections well filled with stock and to pay particular attention to insulation of walls and ceilings, also to provide slots or holes for air circulation near the bottoms of box-stall walls.

While concentration of outtake has no harmful effect, concentration of intake is not permissible. Intake flues must be well distributed around the stable, and a total intake area of 75 percent of the outtake area appears satisfactory. In operation, all intakes should be kept open at all times except in cases where excessive wind pressure causes excessive intake velocities. Even then, they should not be entirely closed. Making covers of intake openings 1 in. short is a good preventive.

The rate of air change through a stable should be controlled by regulation of the outtake aperture. The study showed that the rate of air change depends on the amount of air the outtake is allowed to handle. Air leakage through accidental openings in walls and ceilings will usually supply more air than the permissible rate of change in cold weather if the outtake capacity is not controlled. In many tests outtake velocities remained practically the same whether the intakes were open or closed. In multi-outtake systems, however, closing of all intakes caused backdrafting through one or more outtakes.

The place of intake flues is to bring about even distribution of incoming air and to prevent excessive intake velocities. Intake velocities should be so low that the incoming air will settle to the floor almost vertically as it unites with the down-flowing convection current. Stables without proper intake equipment are usually subject to serious drafts, due to the high velocity of air coming in under doors and other accidental openings.

Wet walls and ceilings, almost universally accepted as indicators of poor ventilation, can be prevented by more insulation more frequently than by increased ventilation. Filling spaces between studs with dry planer shavings or sheeting the inner surfaces of stable walls with commercial insulating board will not only prevent condensation on these areas but will improve the operation of the ventilation system.

Fire hazard of domestic heating installations, G. Q. Voigt ([*U.S.*] *Bur. Standards Jour. Res., 11 (1933), No. 3, pp. 353–372,* [*pls. 2*], *figs.* [7]).—Tests were conducted with stoves, furnaces, and their pipes, spaced at different distances from unprotected partitions, ceilings, and floors, and the maximum temperatures thereon measured in an attempt to determine by experimental means the fire hazard involved. Protections of sheet metal, asbestos, or brick were then applied and the closest distance determined that would be safe from the standpoint of ignition of the wood.

It was found that stoves for house heating should be spaced not less than 24 in. from walls faced with wood. If bright sheet metal is applied to the walls the spacing can be decreased to 12 in. Similarly, plastered wood stud partitions, while requiring a spacing of not less than 18 in. if unprotected, may be spaced at 9 in. if bright sheet metal is applied.

If stoves are without ash pits or if ash pits are heated to near redness, an air space of 5 in. or more was indicated as necessary between the stove and a wood floor in addition to 0.25 in. thick incombustible insulation applied under sheet metal over the exposed portion of the floor. With the firebox resting directly on the floor, temperatures high enough to cause ignition of wood were transmitted through a 4-in. brick base.

Tests with smoke pipes indicated that a clearance of 12 in. from ceiling or joists was adequate. Where smoke pipes pass through combustible partitions, either a ventilated air space of not less than 4 in., or 2 in. of insulation all around the pipe, was found necessary.

Furnaces for hot water installations and their pipes were found to present little hazard to adjacent construction as fired with either coal, oil, or gas. The hazard from warm-air heating ducts was found to be moderate, protections being required only where they enter floors or partitions relatively close to the furnace. In the case of the pipeless furnace, the downdraft of cold air around the warm-air duct protects the adjacent construction, the hazard with this equipment resulting mainly from placing combustible materials on the warm-air register or locating the latter beneath or too close to partitions.

Tests with a gas range having an oven without insulation indicated that a 6-in. separation between the side of the oven and a wood partition gives reasonably safe conditions.

Portable refrigeration chambers for studying cold resistance of plants in the field, J. R. Holbert, W. L. Burlison, and A. G. Johnson (*U.S. Dept. Agr. Circ. 285 (1933), pp. 28, figs. 23*).—Portable refrigeration chambers in which corn plants growing under natural conditions in the soil may be exposed to various temperatures for different periods are described and illustrated and their operation explained.

In general, each chamber consists of a specially constructed refrigerator box open at the bottom so that it can be set down over the plants. The walls and top are heavily insulated with cork, sealed in with hydrolene, and covered inside and outside with thick composition board (homosote). The top is covered with galvanized iron. All is kept heavily painted, both inside and outside. Specially designed equalizers to which the hoists are attached are used on two sides of the chamber for raising or lowering it. Four electric refrigeration units are mounted on one side of the chamber. These refrigeration units have a combined refrigeration capacity equivalent to approximately 1,600 lb. of melting ice in 24 hours. The work involved was conducted in cooperation with the Illinois Experiment Station.

AGRICULTURAL ECONOMICS

[Papers presented at the twenty-third annual meeting of the American Farm Economic Association] (*Jour. Farm. Econ., 15 (1933), No. 3, pp. 421–451, 510–556, figs. 5*).—Included are the following papers presented at the meeting previously referred to (E.S.R., 69, p. 600): Wealth, Income, and Living, by G. M. Peterson (pp. 421–451); Comparative Prices of Farm Products in Canada and the United States Since 1920, by J. F. Booth (pp. 510–580); Review of

Current Farm Taxation Research, by M. M. Daugherty (pp. 531–540); A Program of Research Basic to State Income Tax Legislation as It Affects Agriculture, by M. S. Kendrick (pp. 541–549); and Forest Tax Research as It Affects Farm Taxes, by B. W. Allin (pp. 550–556).

[Investigations in agricultural economics] (*Jour. Farm Econ., 15 (1933), No. 3, pp. 557–574, fig. 1*).—Notes on and description of the following investigations and services are included: Present Trends of Lamb Feeding in Northern Colorado, by H. B. Pingrey (pp. 557–559); Disseminating Outlook Information in Indiana, by W. B. Stout (pp 559–561); Economic Adjustment Meetings in Illinois by H. W. Mumford (pp. 561, 562); Farm Index Ratios in Debt Settlement, by H. R. Danielson and H. E. Ratcliffe (pp. 562–564); Relationships Among Oklahoma Farm Prices, by P. H. Stephens (pp. 564–566); "Vertical" and "Horizontal" Shifts of Demand, by F. L. Thomsen (pp. 566–570); Debt Adjustment Legislation in Saskatchewan, by W. Allen (pp. 570–572); and An Indication of Seasonal Variation in Quality of Eggs on Terminal Markets, by E. W. Gaumnitz (pp. 573, 574).

[Investigations in agricultural economics at the Pennsylvania Station, 1932–33] (*Pennsylvania Sta. Bul. 293 (1933), pp. 12, 34, 35, 36*).—Data secured by F. P. Weaver from 610 farms in 26 counties for the years 1913–31 are reported on rural taxation; also data on the consumption of milk in Allegheny County, secured by T. K. Cowden and F. F. Lininger, and in the Sharon, Farrell, and Sharpsville market, secured by Cowden.

Testing the significance of mean values drawn from stratified samples, T. W. SCHULTZ (*Jour. Farm Econ., 15 (1933), No. 3, pp. 452–475*).—The major purpose of this contribution of the Iowa Experiment Station is "to show, principally by example, that (1) by using analysis of variance the significance of many satistics used by agricultural economists may be substantially improved, (2) the technic is essential to exploit fully and effectively materials drawn from a stratified or otherwise restricted random sample, and (3) it is necessary to plan the internal structural arrangement of a sample to fit the fundamental principles underlying the technic before maximum statistical results can be obtained."

To illustrate the fundamentals of the procedure and the steps and calculations required, analysis is made of 378 corn yield estimates for Iowa for 1930 to show the effect of isolating the geographic variance in corn yields between 9 districts and between the 99 counties of the State and between farms with less than 67 and with over 68 acres of corn.

The agricultural emergency in Iowa (*Ames: Iowa State Col., 1933, pp. X+201, figs. 21*).—This volume includes the circulars previously noted (E.S.R., 69, pp. 131, 603).

Corporate-owned land in Iowa, W. G. MURRAY and R. C. BENTLEY (*Iowa Sta. Bul. 307 (1933), pp. 97–112, figs. 5*).—This bulletin is based on a study of the records of county auditors in 54 of the 99 counties of the State and of the annual reports of life-insurance companies filed with the insurance commissioner of the State. Maps show, by counties, for the 54 counties the acreage and percentage of farm land owned by corporations, and for all the counties of the State the average land value per acre (1930 census), the acreage owned by life-insurance companies on December 31, 1932, and the cost and equity of the companies in such land. Tables show the corporate land holdings in 4 counties, by year of acquisition; the holdings in the 54 counties, first quarter of 1933, of different groups of corporations; the distribution, by years 1920-32, of farms and acreage and cost of farms held by life-insurance companies, December 31, 1932; and the percentage of land held by different groups of corporations.

In the 54 counties, 7.2 percent of the land was held by corporations, the percentage in different counties varying from 1.38 to 21.2. Insurance companies held 3.4 percent, banks 1.6, mortgage and investment companies 1, joint stock land banks 0.6, Federal land banks and refinancing corporations 0.22, and colleges and miscellaneous 0.38 percent. With few exceptions, the highest percentage of the corporate-owned land was in low-land-value counties. Of the land owned by life-insurance companies, over 50 percent was acquired in 1931 and 1932 and all but about 10 percent during the period 1928–32. The difference between the average 1930 value and the average cost of land held by insurance companies was $20 per acre in the 33 low-land-value counties of the State, $40 in the 38 medium-land-value counties, and $62 in the 33 high-land-value counties.

Farm mortgages in the United States: Selected references to material published January 1928–April 1933, compiled by K. Jacobs (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 47 (1933), pp. 86*).—This is a mimeographed list of 451 references to studies and discussions published, with a few exceptions, from January 1928 to April 1933, inclusive. References to Federal laws and congressional hearings and documents are included. References to enactments of State legislation for the relief of agricultural indebtedness (E.S.R., 69, p. 604) are omitted.

The main reasons why range cattle ranchers succeed or fail, C. A. Brennen et al. (*Nevada Sta. Bul. 133 (1933), pp. 22, figs. 4*).—The data included and discussed cover 18 representative cattle ranches in the northeastern part of the State for the years 1928–32. Tables show (1) the average receipts and cost per cow unit (exclusive of interest), by items, and the average calf crop and death loss, by years, with averages for 1928–30 and 1928–32; (2) the average running cost per cow and production cost of calves at 3 months of age, by years, with averages for 1928–30; (3) the costs for each year for 6-, 12-, 18-, 24-, 30-, and 36-month-old animals; (4) the following averages 1928–30, for each of the 18 ranches—percentage of death loss, percentage of calf crop, selling age, pounds of beef produced per cow unit, net cost per unit, production cost per pound, inventory increase per cow unit, and balance per cow unit; and (5) the calf crop and death loss percentages, net cost, beef produced, receipts and balance per cow unit, and the cost per pound of beef produced on the ranches with calf crops of 70 percent or over and on those with less than 70 percent. Using the 1928–30 averages and cost index numbers, 1910–32, other tables show the long-time production costs of a 3-month-old calf, the cost for higher ages, and the cost of producing beef and balance per cow unit on the ranches grouped on the basis of calf crop above or below 70 percent.

Management factors, production output, calf crop, death loss, carrying cost, selling policy, and the fitting of management policies to the ranch set-up are discussed. A number of policies are outlined, which, if put into practice, it is thought will enable outfits suited to range cattle production to whip up efficiency and stabilize the industry.

Efficiency studies in dairy farming, H. C. Woodworth, C. W. Harris, Jr., and E. Rauchenstein (*New Hampshire Sta. Bul. 275 (1933), pp. 54, figs. 13*).—"This study was started for the purpose of going as far as posible into the causes of variations in farmers' net returns in order to determine to what extent improvements can be made by individual farmers under their respective conditions." It was made in cooperation with the U.S.D.A. Bureau of Agricultural Economics.

Thirty-eight wholesale milk farms in northern Grafton County were studied in detail during the year ended March 31, 1932. Financial records were also obtained for the years ended March 31, 1930 and 1931.

For the 38 farms studied, the family incomes for the year ended March 31. 1932, ranged from $711 to $1,721 on 13 farms, from $184 to $670 on 13 farms, and from a loss of $964 to a gain of $162 on the other 12 farms. The price of milk ranged from $1.37 to $2.42 per 100 lb., the milk production per cow from 2,330 to 10,445 lb., the net increase per cow in value from dairy livestock from —$27.85 to +$46.51, the output units per man from 103 to 452, chore hours per cow from 78 to 241 and per 100 lb. of milk from 13.5 to 31.3, and the total cash expenses per $100 income from $26.76 to $93.83.

Methods and costs of husking corn in the field, K. H. Myers (*U.S. Dept. Agr., Farmers' Bul. 1715 (1933), pp. II+18, figs. 6*).—This report of studies in Illinois "shows the elements of cost involved in husking corn by hand, with 1-row pickers, and with 2-row pickers, and the relative importance of these elements of cost, and indicates how the individual farmer can determine the most economical method of husking on his farm. It is based on data obtained from enterprise-cost records kept by 87 farmers who were using mechanical pickers in 1928 and 111 farmers who were operating pickers in 1929, and from detailed cost records from 122 farms on which the corn crop was harvested by hand. In these studies records were obtained showing the cash cost of husking with mechanical pickers and by hand, and the quantities of labor, power, and other materials used. Factors affecting the amount and distribution of costs and the relative advantages of each method are given, and are used as a basis for determining the most economical and practicable method of husking on individual farms and under certain conditions."

An economic study of the cherry industry, with special reference to Oregon, M. N. Nelson and G. L. Sulerud (*Oregon Sta. Bul. 310 (1933), pp. 96, figs. 24*).—Tables and charts are included and discussed showing, among other things, data regarding the relative importance of cherries and other orchard fruits in Oregon; the national, regional, and State trends in plantings and production of cherries; annual shipments and weekly average prices of certain varieties of cherries; the estimated production and utilization of cherries, by kinds, in Oregon and the Pacific Northwest States, average 1926–31; and the prices, by years 1914–31, paid growers in Oregon and competing States. The trends in canned and cold-pack cherries and of fresh cherry shipments in relation to market demands, imports into and exports from the United States of fresh, prepared, and preserved cherries, and other phases of the industry are also discussed.

On the Pacific coast only Oregon and Washington produce sour cherries on a commercial scale. Although the production in these States is relatively small, Oregon being less than 1 percent of the national total, it is already necessary to look for market outlets east of the Rocky Mountains. Efforts to invade eastern markets through sales of canned and cold-packed cherries, in the long run, are not likely to prove successful. Nearly all production of sweet cherries in the United States is concentrated on the Pacific coast, and 24 percent of the acreage in the five western sweet cherry-producing States is in Oregon. Expansion of this acreage has been notable in recent years, particularly in the Pacific Northwest.

In recent years cherries have constituted 5 percent of all canned fruits. The growth of the cherry pack, especially that of sweet cherries, has not kept pace with that of other fruits, but the outlook for any considerable expansion of sweet cherries in canned form is not bright. The outlook for the utilization of sour cherries in cold-pack form is very attractive, as the existing evidence points strongly to the ultimate ascendency of this type of pack. If the tariff rates of the Tariff Act of 1930 are permitted to stand, it is probable that most of the business of supplying domestic markets with barreled cherries, sulfured and in brine, will be shifted to the Pacific coast.

Shipments of fresh cherries from the Pacific Northwest, and to a somewhat lesser degree from California, have been confined almost entirely to black sweet cherries. There has been a pronounced upward trend in shipments from the five far western States. The increase was most notable for Oregon, and its shipments outsold those from Washington and Idaho on the New York City auction.

The future of the black cherry industry does not appear so favorable unless there is a movement to reduce materially the acreage coming into bearing, or a marked improvement is worked out in methods of distribution with the resultant prospect of opening up new consumer areas.

Prices of both sour and sweet cherries in the past have been attractive and acreage has expanded rapidly, but even under more normal business conditions than now exist, the expansion has proceeded too far. Unless constructive measures are taken, price trends for several years are likely to be disappointingly low.

Public utility control of milk in Winnipeg, H. C. Grant (*Jour. Farm Econ., 15 (1933), No. 3, pp. 476–488*).—In May 1932 the Government of the Province of Manitoba passed an act " to control the marketing of milk in the City of Winnipeg by the device of declaring as a public utility, 'any plant, premises, equipment, service, or organization for the production, handling, bottling, furnishing, delivery, keeping for sale, or the sale of milk, including products thereof in a liquid form.' " This article describes the causes and events leading to, the method and theory of, and the results of this control.

The agricultural program of fascist Italy, N. W. Hazan (*Jour. Farm Econ., 15 (1933), No. 3, pp. 489–502*).—The agricultural policy of the fascist regime is described under the two general headings of land reclamation and soil improvement and intensification of agricultural production and development of agricultural exports, cooperation, and education.

Rumania: A guide to official statistics of agriculture, population, and food supply (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 49 (1933), pp. IV+216*).—This is the third of the series of bibliographies previously noted (E.S.R., 68, p. 555), and follows the same general lines. Part 1, compiled by A. M. Hannay, is an annotated list of official publications of the Rumanian Government containing agricultural statistics which may be found in the library of the Department or in the Library of Congress. Part 2, by J. D. Black and C. Ladas, deals with methods of collection and analysis of official statistics.

Price analysis: Selected references on supply and demand curves and related subjects, compiled by L. O. Bercaw (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 48 (1933), pp. 98*).—This mimeographed list of 401 references covers the period January 1928 to June 1933, and is supplementary to the list in the study, Interrelationships of Supply and Price, previously noted (E.S.R., 60, p. 84). No special search was made for references on analyses of prices other than agricultural prices or on price spreads.

Annual fluctuations in the price of corn, G. Shepherd (*Iowa Sta. Res. Bul. 164 (1933), pp. 281–316, figs. 17*).—Analysis is made using a combination of graphic and numerical correlation technic of the factors affecting the annual fluctuations in the United States and Iowa December 1 farm values of corn and of the December corn value at Chicago during the pre-war period 1899–1915 and the post-war period 1922–29. Analysis is also made of the relation of United States corn production, 1909–15, to the December 1 farm price of corn in three Iowa crop-reporting districts representing the change from a surplus to a deficit area. A study is also made of the influence of size of United States corn crop upon the total gross value of the crop.

The analysis showed that the United States December 1 average farm value of corn, 1899–1915, was determined almost entirely by the size of the United States corn crop, the simple correlation coefficient being —0.09738. The regressions of corn value on corn production were —1.62 for the period 1899–1915 and —1.54 for the period 1922–29. Since the war the farm value has also become sensitive to three other factors—numbers of livestock on farms, the rate of industrial production, and perhaps the west-east corn production ratio. The pre-war Iowa December 1 corn price also was determined almost entirely by the size of the United States corn crop, the correlation coefficient being —0.9678. The regressions of Iowa corn value on United States corn production were —2.34 for the pre-war period and —1.99 for the post-war period.

During the pre-war period, the fluctuations in the Chicago price of No. 3 yellow corn were largely explained by the action of three factors—size of the corn crop, quality of the crop, and number of livestock on farms. Since the war the Chicago price has become responsive also to the factor industrial production and perhaps also to the west-east corn production ratio. The regression of Chicago corn value on United States corn production was —1.64 for the pre-war period and —2.22 for the post-war period.

The study of the influence of size of crop on the total gross value of the crop showed that the point of maximum value appears to be with a crop from 80 to 85 percent of the average.

Farm prices of cotton related to its grade and staple length in selected local markets in Mississippi, seasons 1928–29, 1929–30, and 1930–31, L. D. HOWELL, L. E. LONG, J. S. BURGESS, JR., M. L. GARNER, and R. C. SOXMAN (*Mississippi Sta. Tech. Bul. 21* (*1933*), *pp. 63, figs. 5*).—This report is based on data collected in 12 local markets in 1928–29, 10 in 1929–30, and 11 in 1930–31. It is a unit in the study being carried on by the State experiment stations in the cotton States in cooperation with the U.S.D.A. Bureau of Agricultural Economics, to determine the extent to which prices received by growers in the same local market varied on the basis of the grade and staple length of individual bales and to compare these variations in price with the premiums and discounts paid in central markets, to determine whether or not the average prices received by farmers in local markets varied with the average grade and staple length sold in these markets, to compare the fluctuations in prices received in local markets with those in central markets, and to examine the relationship between seasonal variations in price and in average grade and staple length.

Tables are included and discussed showing the average premiums for grade and staple length, the variations in the same markets on selected days, the variations between markets, etc. The factors affecting premiums and discounts in local markets, the influences of quality of cotton produced on farm prices, and the means of improving the conditions are also discussed.

The findings are in general the same as those found in South Carolina (E.S.R., 70, p. 120). The proportions of central market staple premiums and discounts reflected in prices received by growers were considerably greater in the Mississippi Delta markets studied than in the other markets studied. Neither the number nor the type of buyers in the local markets apparently affected materially the proportion of central market premiums and discounts reflected in local market prices.

Crops and Markets, [October 1933] (*U. S. Dept. Agr., Crops and Markets, 10 (1933), No. 10, pp. 369–408, figs. 3*).—Included are tables, reports, charts, summaries, etc., of the usual types on crop and livestock estimates, market reports on field crops, fruits, vegetables, livestock, and livestock, dairy, and poultry products, and the price situation and the price movements of agricultural products.

A study of consumers' preferences and practices in buying and using eggs, R. B. Corbett (*Rhode Island Sta. Bul. 240 (1933), pp. 44, figs. 2*).—Data were obtained by personal visits to 589 housewives in Providence, R.I., and 44 housewives in the villages of East Greenwich and Wakefield, R.I., during the summer of 1928, a period of prosperity, and to 588 housewives in the city and 45 in the villages in the summer of 1932, a period of depression.

In collecting the Providence data the city was divided into five sections on the basis of wealth of the residents.

Of the city families in 1928, nearly 62 percent were American and over 18 percent Italian. In 1932, the percentages were nearly 68 and over 16, respectively. Only one section was not predominantly American, but in that section 91 of the 104 families in 1928 and 77 of the 94 families in 1932 were Italian. In the tabulations and discussions, the data, so far as possible, are presented by the five groups in the city and the two villages combined. Some of the findings, chiefly for the city, were as follows:

The chief sources from which eggs were purchased were farmers. independent groceries, chain stores, and downtown markets, being 31.3, 21.5, 17.5, and 14.6 percent, respectively, in 1928, and 39.2, 10.9, 25.8, and 18.6 percent, respectively, in 1932. The size of purchases in the different city groups averaged from 1.23 to 1.77 doz. in 1928 and from 1.70 to 2.08 doz. in 1932. In the villages, size of purchase increased from 1.26 to 1.73 doz. The quantities did not vary appreciably with season of the year. In 1928, 49 percent and in 1932, 68 percent of the housewives of the city purchased once a week or less frequently. The annual consumption per person in the city groups varied from 25.9 to 36.3 doz., averaging 30 doz., in 1928, and from 26.5 to 32.3 doz., averaging 30.1 doz., in 1932. In the villages, the averages were 24.6 and 34.9 doz., respectively, in the 2 years.

Twenty-nine percent of the housewives in 1928 and 36 percent in 1932 used less expensive eggs for cooking purposes than for eating.

In 1928, 43 percent of the city housewives preferred brown eggs for eating and 44.1 percent for cooking and 39.4 and 39.6 percent, respectively, had no preference between brown- and white-shelled eggs. In 1932, 46 and 47.7 percent, respectively, expressed preference for brown eggs for the two purposes, and 41.4 and 41.9 percent had no preference. In the villages, brown eggs were preferred in 1928 by 54.6 percent for eating and by 56.8 percent for cooking, while 43.2 and 40.9 percent had no preference. In 1932, 64.4 percent preferred brown eggs for both purposes.

Of those replying in 1928, 43 percent in the city and 25 percent in the villages preferred light to medium-colored yolks and 36 and 43 percent dark-colored yolks. In 1932 in the city, 75 percent preferred light to medium and 12 percent dark, while in the villages 70 percent preferred light to medium and 27 percent dark. The number of inedible eggs found decreased from 1 in 3.8 doz. in 1928 to 1 in 5.2 doz. in 1932. Increased egg consumption was not materially affected by high price or poor quality. There was a decided increase from 1928 to 1932 in the percentage of persons preferring eggs packed in cartons.

The average price per dozen at which eggs were considered economical varied from 47 to 63 c., averaging 54 c., for the city groups in 1928, and from 26 to 43 c., averaging 34 c., in 1932. For the villages, the decrease was from 53 to 38 c. In 1932 the city groups would have paid from 58 to 71 c., averaging 60 c., and the vilages 67 c. per dozen for Rhode Island eggs; from 28 to 36 c., averaging 31 c., and 34 c., respectively, for western eggs; and from 22 to 26 c., averaging 23 c., and nothing, respectively, for storage eggs. One fourth of the city housewives were willing to pay an average premium of approximately 3.9 c. per dozen for large size eggs and 23 percent an average premium of approximately 5.4 c. for freshness.

A fruit and vegetable buying guide for consumers, R. G. HILL (*U.S. Dept. Agr., Misc. Pub. 167 (1933), pp. 62*).—Brief descriptions are given covering grading; deterioration of fruits and vegetables; prices, including tables showing, by States of origin, the approximate shipping dates of fruits, vegetables, and melons, and steps in bringing them from the producer to the consumer; and some general hints to consumers regarding buying. Information is also given regarding varieties, grades, packs, etc., and consumer factors of quality for each kind of fresh fruits, vegetables, and melons.

RURAL SOCIOLOGY

The ecological un-balance of man, R. MUKERJEE (*Sociol. Rev. [London], 25 (1933), No. 3, pp. 233–243*).—This is an interpretation of symbiosis and parasitism, biological and social. Man disregards his interrelations not only with inorganic nature but also with other members of the life community, plant and animal. Because of biologic pressure, man cannot utilize the full benefits of his organic and social heritage and becomes an easier prey to other animal parasites of his environment. The spread and virulence of disease illustrates biological and social unbalance resulting from a disturbance of long-established linkages now coming to be recognized adequately.

Social degeneration is considered the result of disregard of ecological unity and organization of a region. Examples of social regression in the field of applied human ecology are deforestation, erosion, continuous single-crop farming and other sources of soil fertility losses, flood and drought, diminution of irrigation water supply, desiccation, deficiency diseases of animals and humans, bacterial and protozoal infections, destruction of excessive numbers of animals and birds for food or materials and of crops and herds by insects and parasites, contamination of a region by waste and sewage, silting up of rivers and loss of natural drainage and flush irrigation, and depopulation of the countryside and congestion in the big cities and manufacturing regions. In contrast with the forces of social regression are the forces of social evolution, such as forestry, scientific pasturage, permanent agriculture, conservation of rain, river, and subsoil water supply, plant and animal breeding, the use of microorganisms in cropping, ecological control of plant and animal pests, preservation of animals and birds from extinction, conservation of environment suitable for animal and human habitation, regional planning of cities, villages, and industries, and economic balance between the forest, meadowland, field, and factory.

Through nature studies and nature activities and regional and occupational education, more real and efficient educational reform and advance in social statesmanship may be attained. Modern industrialism has created a breach not merely between the village and the city but also between rural and urban standards of thought, between the physical sciences and their applications on the one hand and the humanities on the other. Thus a lack of balance between biological, physical, and humanistic studies has accompanied the lack of ecologic balance between populations, their activities, and the region's resources in our present mechanical culture. Rural and regional thought and initiative will now be found to be the most vital and comprehensive corrective of a civilization which, in its desire for wealth and power, has deprived man of many of nature's own gifts and guaranties for his survival and development.

The population of Missouri: A general survey of its sources, changes, and present composition, H. J. Burt (*Missouri Sta. Res. Bul. 188 (1933), pp. 138, figs. 57*).—The settlement of Missouri is viewed as an episode in the westward population drive. Emphasis is placed on the relative status of the farmer class in population, distribution, and changes.

Five main population waves are distinguished after the early settlements of the French and Spanish, the first beginning about 1765; the second, 1796; the third, 1810; the fourth, 1821; and the fifth, 1837. These waves and their contributions to the population of the State are analyzed. A population of less than 20,000 in 1810 had increased to more than 1 million in 1860, more than 3 million in 1900, and more than 3.6 million in 1930. Though the population of the State has continued to increase since the beginning of the present century, the rate of increase has rather steadily declined. The density per square mile of the State, which was 1 in 1820, had increased to 52.8 by 1930.

The State has received only a small proportion of its population from foreign nations, with Germany the greatest foreign contributor since 1850. All foreign immigration has practically ceased, and in 1930 only 4.2 percent of the population was foreign born.

The native migration which now comes into Missouri is chiefly from the adjacent western and southern States, while emigration goes to the adjacent northern and eastern States and to the far West. Since 1870 more population has been lost than gained in interstate migration. The net loss in these migrations was 149,908 for the decade 1920–30, and the accumulated net loss by the year 1930 was 465,143. The effect of migration, therefore, has been to reduce, rather than increase, the population.

The excess of births over deaths increased consistently to a peak of 560,000 in the decade 1890–1900 and has decreased almost as consistently during the intervening three decades. It was the sole cause of increase in total population during the last two decades.

In 1930 the State population was distributed as follows: Urban 51.2 percent; rural farm 30.6 percent; and rural nonfarm 18.2 percent. In the farmer class 500 persons were in the "producing ages" (20 to 64) to every 500 in the dependent ages. In the urban class 633 persons were in the producing ages to every 367 in the dependent ages.

In the village classes the sexes are almost exactly equal while in the farmer class there are 111 males to 100 females, and in the urban class 95 males to 100 females. In the five largest cities of the State the ratio of males to females is falling rapidly. In 1890 the ratio was 112.5 males to 100 females. By 1930 this ratio had fallen to 94.2 males to 100 females.

The negroes have made rapid gains in the process of interstate movement. Numerically, their chief additions to the population have been in the urban class, although their greatest proportionate gain has been in the farm class.

The average size of Missouri families fell from 4.7 in 1900 to 3.6 in 1930. The proportion of village women who are divorced is nearly three times as great, and for urban women the proportion is more than four times as great, as for the farm women. The birth rate has declined from somewhat over 22 per 1,000 of population in 1911–14 to 16.4 in 1931.

A history of agriculture in the State of New York, U. P. Hedrick (*Albany: State, 1933, pp. XIII+462, pls. 31, figs. 42*).—The period covered by this history begins with the early settlements and ends with the nineteenth century. Written not for students of natural or social science but for the farmer's fireside, the book abounds in keenly interesting incidents in the economic and social history of the State. The author states that he was lured by "the changing social scene in rural New York, people, not things." From available records, he gives an account of communities of farmers shaping the destinies of their life as they took possession of a new land, of changes and movements which have multiplied the conveniences and pleasures of farm people, and of the advancement that has been achieved in agriculture and science in New York.

The first five chapters deal with the forest, its mastery and its contribution to the support of the inhabitants for about 200 years; Indian agriculture; land; the agricultural legacy of the colony; and migrations. The next ten chapters deal with agricultural organizations, sustaining industries, turnpikes, country life a hundred years ago, country food and drink, waterways, railways, some curious interrelations of religion and agriculture, human labor displaced by machinery, and the printing press and the farmer. The remaining chapters deal more particularly with the agriculture of the State, including farm crops, livestock industries, horticulture, State aids to agriculture, and readjustments.

The period 1900 to the present was not included because, as the author explains, the twentieth century ushered in an almost new set of agricultural problems—organization, cooperation, farm economics, rural sociology, and industrialism. "These new forces are making changes so profound and they are so far from finished that a history of them needs the perspective of time."

The book was written at the request of the State Agricultural Society, was published by the State as a part of the centennial celebration of the society, and is offered for sale by the New York State Experiment Station.

Social and economic areas of Broome County, New York, 1928, D. Sanderson (*[New York] Cornell Sta. Bul. 559 (1933), pp. 79, figs. 23*).—This is one of a series of studies of New York counties to determine the geographic areas in which the people have economic and social contacts at rural and urban centers; the extent to which the economic and social life is carried on at one center or at several centers in a given area; whether rural communities are growing or declining in population and in economic and social institutions and activities, and the differences of such changes between communities of different size; the extent to which cities and larger villages are drawing business and social activities from the smaller centers; the influence that physiography, roads, distance from cities, occupation, and other factors have upon community changes; and the significance of the facts so ascertained for formulating policies with regard to the establishment and maintenance of public and private institutions, units of government, and rural-urban relations.

Broome County is described in terms of topography, soils, agriculture, history, population, means of communication, economic services, public utilities, high schools, rural churches, and social and educational organizations and activities. Social and economic areas are defined, including buying and marketing areas. In the final sections, rural communities and the use of cities by open-country families are discussed.

Broome County, because fairly typical as to topography, soils, and agriculture of the counties in south-central New York in the Northern Appalachian Plateau, and because it has a larger city and more industrial development than any other county in this group, reveals the effect of the growth of cities on the smaller villages and rural communities.

The farm population decreased 19 percent from 1910 to 1925 and remained stationary in the last five years of this period. The five most sparsely populated towns lost population until 1920 and remained stationary in the last decade, indicating that the peak of the rural exodus has occurred in these towns. Four strictly rural incorporated villages reached their maximum population from 1880 to 1900, declined until 1920, and remained stationary during the past decade. In the past decade there was a rapid growth (225 percent) of several unincorporated villages which are really suburban to the industrial cities, and of the persons living in the country but not on farms. The city population increased by 145 percent between 1900 and 1930, but in the past decade it increased only 14 percent.

From 1900 to 1928 the number of stores and business concerns in the three villages of between 500 and 1,000 inhabitants increased by 26, while the 40 villages and hamlets of 500 inhabitants and less lost 12 concerns. The larger village centers are increasingly the economic centers for their entire trade areas, including many of the areas of the smaller village and hamlet groups. For so-called shopping goods, such as men's and women's good clothing, furniture, and luxuries, patronage goes largely to the cities, and the larger villages are generally unable to compete. Within 10 to 15 miles of Binghamton, a larger proportion of the open-country families in the trade areas of the smaller villages purchase most of their groceries in Binghamton, but outside of this radius this is not true.

Little of the social life of the open-country families is in the cities except as it is represented by the occasional visits to friends or relatives or entertainments. The country people prefer the local rural churches, granges, and other social organizations. Within the trade areas tributary to the cities, comprising about one third of the area, there is a rapid increase of nonfarming, industrial and commercial population, whose assimilation into the older rural communities presents many problems of mutual accommodation, but except as this population is in the densely aggregated suburbs of the cities, where it develops its own suburban social life, there is little evidence that its city contacts are other than economic.

Cities are having a profound influence on rural life through the daily newspapers, which reach practically three fourths of the open-country families, and through the increasing number of contacts which these families have with the city. It is thought that in Broome County, outside of the immediate trade areas of the city, the community life of the people of the open country will center in the larger villages which can furnish the services, economic and social, requisite for their needs.

Some rural social agencies in Ohio: A study of trends, 1921–1931, C. E. Lively (*Ohio Sta. Bul. 529 (1933), pp. 42, figs. 2*).—This is a statement of changes occurring in the distribution and activities of certain rural organizations and agencies operating in Ohio between 1921 (E.S.R., 49, p. 192) and 1931.

Rural farm population declined from 19.7 percent to 15.1 percent of the total. Rural nonfarm population increased till it was greater than the rural farm population. The number of rural population and business centers has decreased while their size has increased.

Since 1921 the number of one-room schools has declined 51 percent, the number of consolidated schools has increased 19 percent, school attendance has increased, and illiteracy has declined slightly. Five counties are now completely consolidated. The number of rural high schools has increased 8.6 percent, enrollment 46 percent, and the number of teachers 30 percent. First grade high schools have increased 48 percent, and junior high schools have become more common. Rural library service was better in 1931 than in 1921, and the reading habit was more widely disseminated.

The agricultural extension service expanded, and radio developed as a new agency for education and entertainment during the decade. Rural physicians have become scarcer and more definitely concentrated in the larger villages. Hospital facilities have increased but are badly distributed. Rural churches continued to decline in numbers. They tend to center in the villages but in the shift many country members are lost. Pastors are better trained than they were 10 years ago, and some progress has been made in interdenominational cooperation. While the Y.M.C.A. has shifted its emphasis to a town-country form of organization, little change was noted in the Y.W.C.A. The Grange has experienced a decline in membership but has increased the vitality of its program. Fraternal orders, generally, have declined, while the Parent-Teacher Association has grown rapidly in rural districts. Boy Scouts have made progress in adapting their program to rural life but have only begun to reach farm boys. Girl Scouts and Camp Fire Girls are no nearer to farm girls than 10 years ago. Changes taking place in Ohio rural life have combined to dissipate the provincialism of the rural districts.

County government costs in Pennsylvania, F. P. WEAVER and H. F. ALDERFER (*Pennsylvania Sta. Bul. 297 (1933), pp. 79, figs. 3*).—The financial responsibility in Pennsylvania of the State legislature, the county controller, the salary board, the county treasurer, and the sinking fund commission is described. Analysis is made of the controllers' and auditors' reports for 1913, 1918, 1924, 1929, and 1931 in 13 counties of the State. Tables show among other data (1) the amount, total and per capita, and indexes (1913=100) of total expenditures, by counties by years, and compare the indexes of total expenditures with those for taxes, farm prices, all commodity prices, and cost of living; and (2) the comparative increases in expenditures for different classes of services. Analysis is made of the relation of size of county, density of population, agriculture v. industry, per capita wealth, mandatory expenses, and debt service to costs of county government. State control over local budget making is discussed.

Suggestions are made for improving the county government under the present set-up, and also for a more businesslike set-up consisting of an elected commission and a controller, the employment of a county manager, and the appointment of subordinate officers and employees by the commission or manager.

FOODS—HUMAN NUTRITION

Diets at four levels of nutritive content and cost, H. K. STIEBELING and M. M. WARD (*U.S. Dept. Agr. Circ. 296 (1933), pp. 59, figs. 9*).—This circular presents for each of four diets—a restricted diet for emergency use, an adequate diet at minimum cost, an adequate diet at moderate cost, and a liberal diet—(1) the quantities of food or food groups required yearly per capita for the population of the United States and per person of different age, sex, and activity, and yearly and weekly per family of varying composition; (2) the nutritive value of the diets in terms of calories, protein, mineral elements, and vitamins in comparison with dietary standards; and (3) the retail cost of the food supply as a whole and the distribution of expenditures among various groups of foods.

Information is included on some factors affecting food prices and food costs, including packaging of food and size of container, grades and quality, seasonal variations in retail food prices, and local and general price levels. In addition to tabulated data many figures are included to illustrate graphically the points discussed. Among these are graphs showing the nutrients purchasable for 1 c. in 16 common foods, the relative monthly price changes of specified foods and food groups, the months of greatest abundance of low and medium cost fruits and vegetables, variations in retail prices of specified foods expressed as percentage of average prices, and variations in cost of the minimum cost adequate diet for a family of 5 and of various food groups in this diet in different cities of the United States. In all of these charts 1931–32 prices are used.

"Extension workers will find the yearly food allowances useful in helping farm families to plan their programs of food production for home use. Welfare agencies and teachers will find the weekly food allowances helpful in discussing food budgeting problems with city families. Institutional managers will find the allowances for individuals by age groups of assistance in planning for quantity purchases of food. And economists and others interested in coordinating food production, manufacture, and distribution with consumer needs will find in the yearly per capita figures a basis for planning the best use of the food resources of a community, region, or nation. The general use of either of the two diets at the higher levels of nutritive content would not only improve the health and efficiency of the population, but at the same time would foster the type of agriculture which represents wise utilization of land for the country as a whole."

Infant feeding and its relation to the health of the school child, J. Greenwood Wilson (*Pub. Health [London], 46 (1933), No. 11, pp. 356–363*).—This report is based on case record cards of infants attending two child welfare centers in South-East Lancashire, England, during 1929 and 1930, and statements by mothers of older children brought to the minor ailments clinic within the periods September 1930 to February 1931, inclusive.

Of the 407 infants (210 male and 197 female) for whom the cards were obtained, only 50 percent were breast-fed for 3 months, 30 percent to 6 months, and 25 percent to 9 months, although it is considered that in at least 40 percent of those weaned prematurely (before 6 months) breast feeding could have been maintained if the mothers had sought advice before and after the birth of the child.

The data obtained from statements of mothers concerning the past history of children of school age with relation to length of breast feeding gave no indication of a lowered resistance to disease of those who had been artificially fed as compared with breast fed during infancy. There was some indication of a favorable effect of breast feeding upon general health, although it was concluded that the health of the school child cannot be predetermined by the method of feeding during infancy alone. In this connection the author expresses the opinion that the period intervening between infancy and school age has suffered a comparative neglect in child welfare work.

The reliability of school survey data on milk consumption and the relation of a school health program to home purchases of milk, F. F. Lininger (*Pennsylvania Sta. Bul. 293 (1933), pp. 33, 34*).—This is an abstract of a mimeographed report of a survey of milk consumption and purchasing habits showing that families represented in certain school health classes not only kept up their home purchases of milk from regular distributors notwithstanding larger consumption of milk in the schools but also purchased milk with greater regularity than all families included in the survey.

Growth and reproduction on synthetic diets.—III, A note on fats, G. A. Hartwell (*Biochem. Jour., 27 (1933), No. 1, pp. 146–150, fig. 1*).—In continuation of an earlier series of studies (E.S.R., 58, p. 392), the author has compared the nutritive value of various fats by feeding them to rats at a level of 16 g daily in a diet composed of pure casein 20, pure potato starch 64, salt mixture 4, and marmite 5 g and prepared with 300 cc distilled water by the cooked method described previously (E.S.R., 55, p. 411). The diet was also supplemented with 4 cc of cod-liver oil daily.

The fats used were beef and mutton suets (prepared by freeing the fat as much as possible from connective tissue and mincing it finely), bacon fat prepared by separating fat from lean and mincing it, fresh dairy butter and commercial margarine, lard, and olive oil. Six males and 6 females were used for each test. The animals were kept together except just before litters were expected, when the females were removed to separate cages.

Growth in no instance equaled that of the controls on a mixed diet of kitchen scraps, but was best on bacon fat, lard, and margarine, followed by butter, olive oil, and mutton tallow, and finally by beef fat. In general the animals were active and appeared in good condition, except that after about 10 days on the diet the fur began to come out, eventually growing in again at different rates.

No litters were born to the does fed bacon fat or lard and there was evidence of resorption in the uteri, suggesting lack of vitamin E. Litters were born to most of the does on the other diets, but none of the diets was considered satisfactory for reproduction or lactation.

The forms of the calcium and inorganic phosphorus in human and animal sera, I, II (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 27–55, fig. 1; pp. 57–78*).—Two papers are presented.

I. *Normal, rachitic, hypercalcemic, and other conditions*, H. R. Benjamin and A. F. Hess (pp. 27–55).—A method is described for the quantitative estimation of the calcium and phosphorus partition in blood sera and ultrafiltrates, and data are reported on the distribution of these elements as thus determined in normal sera of different species and in sera in rickets and other pathological conditions in which calcium and phosphorus may be involved.

The method consisted essentially in dividing the serum into three portions. The first was used for determinations of calcium and phosphorus and, wherever possible, protein. The second portion was shaken with 40 percent dry barium sulfate as an adsorbent, and the amounts of calcium and phosphorus adsorbed were determined by analysis of the supernatant fluid after centrifuging. The third portion was subjected to ultrafiltration, and after the removal of aliquot samples for calcium and phosphorus determinations the adsorbability of both in the ultrafiltrates was determined. The technic for the various steps in the procedure is described in detail.

The normal sera tested included those of human adults and infants, immature rats, and mature dogs. Calcium was found to be present in the normal sera of all of the species tested in at least four forms, two of which were diffusible and two nondiffusible. "Of the diffusible calcium, about two thirds is in the form of an adsorbable calcium-phosphorus complex; the remainder contains the calcium ion. Of the nondiffusible calcium, about one quarter is adsorbable by barium sulfate and is regarded as part of a second, nonfiltrable complex. The remainder, which is not adsorbable, contains the calcium usually described as bound to protein. The inorganic phosphorus in normal serum was found to be present in at least two forms, one of which is the filtrable, adsorbable calcium-phosphorus complex."

Disturbances in the calcium-phosphorus partition were found to occur in rickets. "The change consists of a definite diminution in the adsorbable fractions of the calcium and an increase in the ionic and 'protein-bound' forms. The reduction in amount of the adsorbable calcium-phosphorus complex is intimately associated with a diminution in the total and the adsorbable fraction of phosphorus. The diminution in the concentration of the adsorbable calcium-phosphorus complex is present in the serum in rickets regardless of the level of the total calcium as well as that of the total phosphorus. It is therefore the most characteristic change manifested in the serum in this disease. Thus, in canine rickets, which is of the low calcium type, the disturbance is associated with a qualitative alteration in the inorganic phosphorus partition. This consists of a pronounced fall in the level of the adsorbable phosphorus and bears a relation to the reduction in the amount of total calcium."

Preliminary data are also reported on the calcium and phosphorus partition in the serum in hypercalcemia and various diseases in which calcium and phosphorus are involved.

II. *The nature and significance of the filtrable, adsorbable calcium-phosphorus complex*, H. R. Benjamin (pp. 57–78).—This paper reports a similar study of the partition of calcium and phosphorus in a mixture of inorganic salts in amounts approximating the concentration of these substances in ultrafiltrates of normal serum. The mixture was shaken with barium sulfate according to the same technic as in the first study, and the nature of the calcium-phosphorus complex in the ultrafiltrate was studied in a variety of ways, with the conclusion that the complex was similar to and probably identical with the filtrable adsorbable calcium-phosphorus complex in serum.

The artificial ultrafiltrates were next compared with normal serum in vitro adsorption experiments with the epiphyseal cartilage of long bones of 3 weeks old normal rats and later of markedly rachitic rats. The carbohydrate from normal rats proved capable of adsorbing the calcium-phosphorus complex from the artificial solution as well as from the serum. Almost no adsorption occurred when the complex had previously been shaken with barium sulfate. The cartilage of the epiphyseal junction of rachitic long bones adsorbed the calcium-phosphorus complex from normal but not from rachitic serum.

"It is suggested that normal calcification of bone involves the adsorption of the calcium-phosphorus complex of the serum by cartilage in the region of the epiphyseal junction. When, as in rickets, the concentration of this complex is reduced below a certain level, adsorption, and consequently calcification, is retarded."

Comparative analysis of forms of calcium and inorganic phosphorus in human and cow's milk, A. F. Hess and H. R. Benjamin (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1358–1361*).—The authors' technic for separating the calcium of blood serum into four and the phosphorus into two forms, as noted above, has been applied, with certain modifications, to cow's milk and human milk. It was found possible to separate the calcium of the milk into fractions similar to those obtained from the serum. Human milk was found to resemble either human or bovine serum more closely than did cow's milk in the relative amounts of the different fractions. The proportion of filtrable calcium in human milk was more than twice as high as that in cow's milk, and the proportion of filtrable absorbable calcium was also much higher. It is noted, however, that the absolute amount of the filtrable absorbable fraction of calcium is small in human milk as compared with that in cow's milk, so that even with a two-thirds dilution cow's milk would supply a greater amount of this form of calcium to the infant than human milk, and that it is unlikely that the greater efficacy of human milk in the prevention of rickets can be attributed to these differences in composition.

The phosphorus of the milk could be separated into four fractions corresponding to the four calcium fractions and of similar relative concentration. Partition of calcium and inorganic phosphorus in cow's milk was not affected by irradiation or pasteurization.

Fundamental food requirements for the growth of the rat.—VII, An experimental study of inheritance as a factor influencing food utilization in the rat, H. P. Morris, L. S. Palmer, and C. Kennedy (*Minnesota Sta. Tech. Bul. 92* (*1933*), *pp. 56, figs. 15*).—Continuing this series (E.S.R., 65, p. 690), a study was made of the food utilization of from 500 to 600 rats descended from a single pair. The efficiency quotient employed as a measure of food utilization was calculated as the quotient resulting from dividing the total dry matter consumed per unit of gain in live weight by the mean weight of the animal multiplied by 100.

Strains showing high and low efficiency of food utilization were selected. The F_5 to F_9 generations in the high line showed an efficiency index ranging from 1.94 to 2.32, while the average efficiency index in the different generations in the low line ranged from 2.83 to 3.26. The differences per generation ranged from 0.82 to 1.19, thus showing the progress which was being made in the selection of the different lines and the indication of the heritability of this characteristic. There was also shown in the study a decided difference between males and females in the efficiency indices exhibited, a correction factor of 1.678 being necessary to raise the efficiency index of males to a scale comparable to that of females.

The efficiency of food utilization by the animals was studied with reference to body weight, dry matter consumption, surface area, chemical composition, gain in weight, and other factors. As might be expected, the food utilization was more closely associated with surface area than with body weight, but the chemical analysis of the entire carcass showed that female rats at the approximate age of 10 weeks were composed of a higher percentage of dry matter, fat, and ash, and a lower percentage of nitrogen and fat-free dry matter than males.

Studies were made of the correlation of the efficiency indices with various other characters such as live weight, intestinal length, dry matter consumption, etc. Practically all of these correlation coefficients were less than 0.8. The weekly correlation coefficients between dry matter consumed and gain in live weight in a 6-week period ranged from 0.4 to nearly 0.7, which were considered to indicate that the equalization of the food consumption of pairs of litter mates does not give sufficient control over a growth experiment to warrant the use of the paired-feeding trial for evaluating quantitatively the growth-promoting qualities of dietaries differing in only one constituent when a small number of animals are used. Males showed less variability in the efficiency indices than females, indicating that the male is more desirable than the female for growth studies. The importance of securing greater uniformity as regards food consumption and gain factors in selecting experimental animals is emphasized. Considerable progress was made in increasing the uniformity of the efficiency of food utilization through selective breeding, which was exhibited in the F_6 and later generations in both lines.

Vitamins every day, H. C. Cameron (*West Virginia Sta. Circ. 66* (*1933*), *pp. 15, figs. 2*).—This circular summarizes in a clear, concise manner present knowledge concerning the properties, physiological function, and occurrence of the vitamins, with special emphasis on the fact that larger amounts of all vitamins are necessary for optimum health and vigor than for the prevention of actual disease. An unusual feature is the presentation of the quantitative distribution of vitamins A and C in the form of charts showing their relative distribution in average servings of some common foods.

Losses of vitamin A in drying fresh raw carrots and sweetpotatoes and canned spinach, G. S. Fraps and R. Treichler (*Jour. Agr. Res.* [*U.S.*], *47*

(1933), No. 7, pp. 539–541).—The data reported in this contribution from the Texas Experiment Station have already been noted from its Bulletin 477 (E.S.R., 70, p. 131). Considerable losses in vitamin A in all three food materials occurred as the result of drying It is thought that fresh green vegetables may contain much higher amounts of vitamin A than might be expected from tests of the dried material.

Changes in the incisors of albino rats accompanying a deficiency of vitamin A, M. C. Smith and E. M. Lantz (*Jour. Home Econ., 25 (1933), No. 5, pp. 411–415*).—This contribution from the Arizona Experiment Station describes and summarizes physical and chemical changes which have been observed in the incisors of albino rats on diets deficient in vitamin A but furnishing sufficient vitamin D.

"The incisors ceased to grow at the normal rate, lost their luster and normal orange pigment, and became short and blunt as well as white and opaque. The inclusion of viosterol did not prevent or delay the appearance of these characteristic changes, but the addition of vitamin A in the form of cod-liver oil resulted in normal incisors. Comparison of the chemical analyses of the incisors of the animals deficient in vitamin A and of their litter mates receiving cod-liver oil showed that the former contained a lower percentage of ash, but with a higher percentage of calcium and a slightly lower percentage of phosphorus in the ash and hence higher calcium-phosphorus ratio in the incisors. No significant differences were found in the composition of the bones of the two groups of rats."

Investigations into vitamin A-free basal diets, I, II (*Biochem. Jour., 27 (1933), No. 1, pp. 5–16, figs. 8; 17–21, fig. 1*).—Two papers are presented.

In the first paper, by A. L. Bacharach, attention is drawn to two of the main difficulties associated with vitamin A experiments: (1) The occasional failure of the experimental animals to cease gaining in weight, and (2) the more frequent failure of the animals to show normal growth response after large doses of the vitamin have been given. Attempts over a period of years to solve these and other problems in vitamin A experiments are reported, with the general conclusion that the basal diets used must have been deficient in more than vitamin A. As possible sources of such deficiency the author suggests shortage of one or more substances, such as vitamins of the B group or amino acids in a diet qualitatively correct, the absence of some known factor such as vitamin E or roughage, or of some new or unrecognized factor, or a combination of two or more of these causes. No explanation could be found for the occasional failure of animals to cease growing on the basal diet. With two different diets, one containing no fat, the depletion period, weight, and degree of recovery during the curative period seemed to be independent of the sources of protein examined. Long depletion periods could not be explained in terms of vitamin A storage.

The experiments described in the second paper, by Bacharach and E. L. Smith, were carried out (1) to study the effect of deprivation of vitamin A on the lymphatic tissue in various parts of the body and (2) to compare the differences in growth-promoting properties of the stock diet and a vitamin A-free diet supplemented with vitamin A with the reserves of vitamin A in the livers of the experimental animals. Only a preliminary note is given on the findings in the first part of the inquiry.

In three comparable groups of 6 young rats each fed upon the stock diet, a vitamin A-free diet supplemented with vitamin A, and the basal vitamin A-free diet alone, growth was more rapid and total gains were larger in the first group than the second and this in turn than the third, although the animals in the third group reached an inconveniently high weight and had barely ceased to grow at the end of 150 days. The liver reserves of vitamin A in each animal, as estimated by the Moore method (E.S.R., 69, p. 150), were consistent with the relative growth of the three groups.

In attempts to improve the basal diet so that upon the addition of vitamin A normal growth would result, some success was achieved by placing the young suckling rats with their mothers on the basal diet at 9 or 10 days of age. The question is raised as to the " soundness of the present assumptions about the passage of vitamin A from the maternal to the embryonic and suckling organism and the effect of vitamin A reserves in the young animals on their growth potentialities. Either some hitherto unsuspected phenomenon must be responsible for the relation between 'running out' time and preweaning diet, or a vitamin A reserve of 100 mg (C.L.O.) in the weaning rat is a significant factor in protecting it against vitamin A deficiency."

The influence of the basal diet in the determination of vitamin A, K. Culhane (*Biochem. Jour.*, *27* (*1933*), *No. 1*, *pp. 69–82*, *figs. 9*).—The experimental work reported in this paper consists chiefly of a comparison of two basal diets for vitamin A determinations—Diet A 51 C of Coward et al. (E.S.R., 66, p. 591), consisting of " light white casein " 15, rice starch 73, dried yeast 8, and Steenbock salt mixture No. 40 4 percent, with 2 units of vitamin D given twice a week by pipette; and the author's Diet A 5 consisting of extracted and heated casein 20, rice starch 60, marmite 5, Drummond and Watson salt mixture 5, hardened fat 9.9, and radiostol (3,000 U) 0.1 percent. It is stated that rats placed on the latter diet at 4 weeks of age grow well at first, cease growing after from 6 to 10 weeks, and decline more or less rapidly. Definite signs of xerophthalmia appeared regularly just before or at the same time as the rats stopped growing. The diet does not prevent pregnancy or birth of the young which, however, do not survive more than 2 or 3 days if the mother remains on the synthetic diet. If the animals are given a sufficient dose of cod-liver oil or vitamin A concentrate at the time when growth has ceased, their health is quickly restored to normal.

The experiments were so arranged that at the time of cessation of growth and appearance of xerophthalmia on Diet A 5 the effects were tested in turn of the substitution of each ingredient of Diet A 51 C for the corresponding ingredient of Diet A 5. Replacing light white casein with heated and extracted casein led to the conclusion that the former has about $\frac{1}{200}$ the vitamin A content of cod-liver oil. The differences in the two diets with respect to their fat content were shown to be responsible for the development of skin lesions on the fat-free Diet A 51 C and not on the fat-containing Diet A 5, perhaps because the removal of fat may have caused a partial deficiency in vitamin B (complex). A comparison of the effects of 5 percent marmite and the same quantity of yeast led to the conclusion that the yeast contained traces of vitamin A. No difference was shown between the effects of dextrinized and uncooked starch. Evidence was also obtained that both the dried yeast and the light white casein, in comparison with the marmite and extracted casein, contained some vitamin D.

In discussing these results in their application to vitamin A determinations, the author states that the simplest explanation of the fact that xerophthalmia does not develop on many of the basal diets used is that the diets contain traces of vitamin A. This does not explain the results of Coward et al. (E.S.R., 66, p. 591), indicating the presence in light white casein of some factor capable of supplementing cod-liver oil. The possibility is discussed that cod-liver oil and most concentrates contain two factors which are together associated in producing the effects commonly ascribed to vitamin A.

"There is no doubt that the solution of the whole problem of vitamin A testing would be greatly facilitated by a clearer definition of vitamin A deficiency than has so far been given. . . . Cessation of growth is certain to occur long before there is a complete deficiency of any specific factor. For this reason it is impossible to pronounce a diet as satisfactory for vitamin A testing simply because growth may be arrested at a certain stage and stimulated again by addition of the best substance. Where a standard is used it is not of paramount importance to have a standardized basal diet for testing the vitamin preparation, but when the desired result is the 'minimum effective dose', it is obviously essential that the diet should be completely devoid of the particular vitamin. A comparison of absolute results obtained in different laboratories is rendered quite useless if this is not the case, and where the standard employed is not a pure sample of the substance measured, as in the estimation of vitamin A in terms of carotene, the necessity for a standardized diet must be emphasized."

An application of the paired feeding method to the quantitative estimation of the relative vitamin A contents of foods and artificial concentrates, O. F. GARRETT and H. H. MITCHELL (*Amer. Jour. Physiol., 104 (1933), No. 3, pp. 608–614, fig. 1*).—This paper reports the adaptation to vitamin A determinations of the paired feeding method, essentially as described below for vitamin B, with illustrative data on the application of the method to a sample of butterfat prepared from milk collected from stall-fed Guernsey cows.

Differences in the rate of depletion of the body reserves of vitamin A in young rats made subsequent matching difficult, and for this reason a method of feeding the stock females producing the young was devised which resulted in very low reserves in the young at birth. The technic consisted in placing the rats on a ration containing no known source of vitamin A for 2 weeks before mating and for the entire gestation and lactation periods, adding to the ration 1 percent of cod-liver oil only during the gestation period. The diet consisted of casein 20, Osborne and Mendel salt mixture 4, dried irradiated yeast 5, sucrose 10, starch 51, and glycerol 10 percent. During gestation the cod-liver oil and during the experimental period the butterfat replaced equivalent amounts of the glycerol. At least four pairs of rats were used for each concentration of the butterfat tested, and the feeding was continued for 5 or 6 weeks.

Under the conditions of the experiment the amount of butterfat required to furnish enough vitamin A for maximum growth was from 4 to 4.5 percent. As was true of the vitamin B in the studies noted below, the cod-liver oil was found to improve the appetite even when sufficient vitamin A was furnished for maximum growth.

The authors express the opinion that "the unique advantage of the method over all others thus far proposed is that the entire food intake of the experimental rats is under complete control, so that all comparisons of growth rates are made only between animals receiving the same amount of food. Hence, differences in growth can be traced more directly to differences in vitamin intake."

An application of the paired feeding method to the quantitative estimation of the relative vitamin B contents of foods and artificial concentrates, H. H. MITCHELL (*Amer. Jour. Physiol., 104 (1933), No. 3, pp. 594–607, figs. 2*).—In the method described the paired feeding technic has been applied, the difference between the food intake of the animals in each pair consisting solely in additional vitamin B in the form of 3 drops of tikitiki extract daily for one of the two rats. The materials tested for vitamin B were Reid Yellow Dent corn and wheat. Graded amounts of these materials were incorporated in the basal vitamin B-free diet, with such alterations in the other constituents as necessary to keep the same percentage composition. The concentration of the test material essential for maximum growth was estimated from the concentration furnishing as good growth throughout the experimental period of from 3 to 5 weeks, following a depletion period, as on the basal diet supplemented with tikitiki extract. The pairing was done at the end of the depletion period, and eight pairs of rats were used for each concentration of the material tested.

As thus determined, the critical concentration of the corn was estimated as between 40 and 45 and of the wheat between 50 and 55 percent of the ration, indicating a lower vitamin B content in wheat than in corn. These values were obtained on diets containing 18 percent of casein. The corn experiments were repeated at a higher casein level, 30 percent. At this level the critical percentage of corn was below 30 and 35 percent, suggesting either a sparing action of the protein for vitamin B or the presence of some vitamin B in the casein. The latter was proved not to be the case.

Another paired feeding test was carried out to determine the level of dried yeast (Northwestern) necessary to supply enough of the various B vitamins for maximum growth of young rats on a basal ration of extracted casein 29 or 30, Osborne and Mendel salt mixture 4, filtered butterfat 8, cod-liver oil 2, sodium chloride 1, purified sucrose 10 percent, with enough extracted cornstarch to make up the diet with the desired percentage of yeast to 100 percent. The concentration required was established at 6 percent.

In all but one of the tests comprising this investigation, the rats receiving the 3 drops of tikitiki extract exhibited a better appetite than their control mates regardless of whether or not greater gains in weight resulted from the consumption of more vitamin B. "This is in agreement with the experience of other laboratories, but it goes further in suggesting that the appetite-stimulating effect of vitamin B results even when the vitamin B content of a ration already adequate in this respect is increased. If this is the case, there is evidently no close relation between this effect of the vitamin and the animals' requirement for it, so that the significance of attempts to measure animal requirements of vitamin B by methods based upon the amounts of food voluntarily consumed is brought into question."

Further observations on vitamin B_2, B. C. Guha and P. N. Chakravorty (*Indian Jour. Med. Res., 21 (1933), No. 1, pp. 211–219, figs. 3*).—This paper supplements an earlier one (E. S. R., 67, p. 188), with data on the vitamin B_2 content of aqueous extracts of the livers of widely different species and of ox spleen, muscle, and kidney. The technic followed in extracting the tissues and conducting the vitamin tests was essentially the same as in the earlier study. In presenting the results, the authors have established their own unit of vitamin B_2, which differs from the Sherman unit customarily employed in this country. The unit is defined as "the amount which, when administered daily to young vitamin B_2-deficient rats, would produce a weekly gain in weight of approximately 10 g for a period of 2 or 3 weeks."

The unit values of the extracts tested, calculated in terms of 100 g of the tissues used in prepared extracts, are buffalo liver 54, sheep liver 77, goat liver 44, pig liver 22, fowl liver 45, fish liver 0, ox liver (average) 50, ox liver (1 sample) 100, ox spleen 63, ox kidney 67, buffalo kidney 83, ox muscle 0, and ox muscle and ox muscle residue 0.

An H-ion concentration of pH 5 was found to be optimum for the extraction of vitamin B_2 from liver (buffalo). Further evidence was obtained that the stability of vitamin B_2 varies with the tissues. In ox kidney the vitamin appeared to be particularly unstable to heat and alkali. A large proportion of the vitamin was destroyed by heating the extract at pH 10.5 for 15 minutes on the water bath. Efforts at stabilizing the vitamin through the addition of gelatin, egg albumin, or blood albumin gave negative results.

Vitamin G (B_2) in fruits, P. L. Day and W. J. Darby (*Jour. Home Econ., 25 (1933), No. 4, pp. 319–323, figs. 3*).—In continuation of studies on vitamin G content (E.S.R., 69, p. 155), data are reported on the vitamin G content of various fruits as follows: The fresh pulp of peeled apples of the Delicious variety (grown in Arkansas and Washington) ⅓ unit per gram, the pulp of fresh avocado of the Fuerte variety, trade name Calavo, ⅔, the strained juice or combined pulp and juice of fresh California oranges ⅓, and the pulp of fresh Bartlett pears 1 unit per gram.

"In comparison with other fresh foods of plant origin, apples and oranges were found to be poorer in vitamin G than such root vegetables as beets, carrots, potatoes, and turnips. Avocados and pears were found to be better sources of the vitamin than the root vegetables, but poorer than the leafy ones."

The nature of the haemopoietic factor in marmite, L. Wills (*Lancet [London], 1933, I, No. 24, pp. 1283–1286*).—Marmite (Vegex) has been shown to be curative in tropical and other macrocytic anemias, such as the pernicious anemia of pregnancy, but clinical trials of various preparations containing vitamins B_1, B_2, and B_3 have given negative results, showing that the active substance in marmite is not one of the B vitamins.

A preliminary report on the cure of nutritional anemia by one of the legumes, D. H. Cook and T. Rivera (*Amer. Jour. Trop. Med., 13 (1933), No. 3, pp. 327–337, figs. 3*).—This report is of interest not only in showing that one of the legumes, pigeonpeas (*Cajan cajan*) known as gandules in Puerto Rico, has hemoglobin regenerating properties as tested on anemic rats, but also in suggesting a modification of the customary method of testing for this property. In the opinion of the authors, qualitative differences in response to different foods can be detected more successfully by feeding the materials at levels designed to give suboptimal rather than maximum hemoglobin response. By feeding graded suboptimal doses, as is now the customary technic in quantitative vitamin determinations, slight differences in response may be detected that would not appear on large doses. The possibility is suggested that the contradictory evidence concerning the essential role of iron and copper in the formation of hemoglobin may be explained on the ground that certain experimental basal diets are furnishing the necessary organic radicles for hemoglobin formation and lack only iron and copper, while others may be lacking in organic radicles as well.

In the present study the ash from 10 g of the gandules was as effective as the corresponding amount of the fresh material, while the ash from 5 g was appreciably less potent than 5 g of the fresh material. This shows that at the higher level a difference between the fresh material and ash could not be detected, although such a difference actually existed as shown by the results on the smaller dosage.

A case of pernicious anaemia treated with vitamin B_2 from egg white, L. Wills and A. Naish (*Lancet [London], 1933, I, No. 24, p. 1286*).—Negative results are reported in the treatment of a case of pernicious anemia with a concentrate of egg white as a source of vitamin B_2, alone and after incubation with human gastric juice. These results are thought to provide further evidence in support of the opinion that the extrinsic factor of Strauss and Castle (E. S. R., 68, p. 280) "is not vitamin B_2, but some other factor as yet undetermined which is present in both animal protein and marmite."

Treatment of secondary anemia, with special reference to the use of liver extract intramuscularly, W. P. Murphy (*Arch. Int. Med., 51 (1933), No. 5, pp. 656–678, figs. 3*).—Observations are reported on the value of various treatments for secondary anemia, with the conclusion that the most striking improvement occurred in patients receiving intramuscular injections of a solution of liver extract together with iron by mouth, and in those taking rather large amounts (240 g.) of whole liver daily, together with iron. It is noted that large amounts of liver are taken less readily by patients with secondary than with pernicious anemia.

The determination of vitamin C in diploid and tetraploid tomatoes, K. M. Key (*Biochem. Jour., 27 (1933), No. 1, pp. 153–156*).—In the experiments reported, the method of Key and Elphick (E. S. R., 67, p. 189) was used to determine the vitamin C content, and the data obtained were calculated in international units by comparison with the values obtained in control tests with lemon juice. Preliminary tests showed that the juice obtained by pulping tomatoes bought in the open market in a mortar and squeezing through course muslin had a vitamin C value of 2.2 international units per cubic centimeter, so that the juice was roughly about one fifth as potent in vitamin C as lemon juice. Juice prepared in the same way from diploid and tetraploid varieties grown in neighboring rows contained 2.3 and 2.4 international units per cubic centimeter. Commenting upon these findings, the author states that "the fact that there appears to be no difference between the vitamin C contents of diploid and tetraploid tomatoes of the same genetic constitution indicates that the number of chromosomes is not the sole factor controlling the vitamin C content."

Vitamin C and the suprarenal cortex.—II, Loss of potency of guinea-pig suprarenals in scurvy, with notes on a method for determining antiscorbutic activity (hexuronic acid) by chemical means, L. J. Harris and S. N. Ray (*Biochem. Jour., 27 (1933), No. 1, pp. 303–310, figs. 2*).—This paper gives the experimental data alluded to in part 1 (E. S. R., 69, p. 904), showing that the adrenal gland of the normal guinea pig has an antiscorbutic activity similar to that of the ox and that this activity disappears completely with the development of scurvy. Further details are also given of the chemical method developed from the Tillmans test for estimating the ascorbic acid content of food materials (E. S. R., 69, p. 169), with data showing the application of the method in orange juice and lemon juice and the correlation between the content of ascorbic acid and vitamin C in these and other materials.

Note on the antiscorbutic action of ascorbic acid [trans. title], J. Brüggemann (*Hoppe-Seyler's Ztschr. Physiol. Chem., 216 (1933), No. 3–4, pp. 139, 140*).—Ascorbic acid, isolated by J. Tillmans from rose hips, was found to protect guinea pigs completely against scurvy in doses of 800γ (0.8 mg) daily.

The alleged antiscorbutic activity of a mixture of methylnornarcotine and glycuronic acid, W. J. Dann (*Biochem. Jour., 27 (1933), No. 1, pp. 220–224, fig. 1*).—This is the detailed report of an investigation noted essentially from a preliminary report (E.S.R., 69, p. 10).

Avitaminosis in natives of Rhodesia: Treatment of epidemic scurvy by the intravenous injection of citrus, T. J. Dry (*Arch. Int. Med., 51 (1933), No. 5, pp. 679–691*).—An account is given of the various factors considered responsible for an outbreak of scurvy among native laborers in Rhodesia engaged in railroad construction and living in a series of camps. Although receiving government rations in camp, inadequate diet during the long journey to the camp and refusal to eat some of the protective foods in the ration are considered chiefly responsible for the development of scurvy in varying degree in about 60 percent of the camp population. As an emergency method carried out in one of the nine hospitals in the area, the treatment consisted in the intravenous injection of orange or lemon juice prepared as follows:

"The juices were expressed from fresh oranges or lemons, previously immersed in a 5 percent phenol lotion to sterilize the skin of the fruits. The extract so obtained was filtered under aseptic conditions and then rendered neutral or slightly alkaline in reaction by the addition of 20 percent sodium hydroxide. This was always freshly prepared and used the same day. The initial dose was 5 cc, thereafter from 10 to 15 cc twice weekly."

The rate of recovery was more rapid in the group of patients thus treated than in similar groups of patients receiving orange juice orally.

Vitamin D and the conservation of calcium in the adult, II, III, V. M. Templin and H. Steenbock (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 209–224*).—In continuation of the series noted previously (E.S.R., 68, p. 566), two papers are presented.

II. *The effect of vitamin D on calcium conservation in adult rats maintained on low calcium diets* (pp. 209-216).—Three rations were used in this study. The first was a nonirradiated low calcium ration containing 0.058 percent calcium and 0.28 percent phosphorus, the second the same ration irradiated, and the third a normal control ration containing 0.56 percent calcium and 0.58 percent phosphorus. Forty female rats ranging in age from 21 to 25 weeks and in weight from 203 to 276 g were divided into four uniform groups, one of which was killed at the beginning of the experiment for tissue analysis and the others maintained on the three rations for from 29 to 30 weeks, during which the animals were weighed weekly and vaginal smears examined for the last 17 days. At the close of the experiment the femurs were excised, measured, and analyzed for ash, the blood serum was analyzed for calcium and inorganic phosphorus, the parathyroids were sectioned and examined histologically, and the incisor teeth were kept for later analysis.

Weight differences became apparent after about the eighth week in the nonirradiated low calcium group and the eleventh week in the irradiated group, when failure to maintain weight, followed by gradual losses, took place. In general behavior and appearance no significant changes were noted until about the tenth week, with pronounced differences by the fifteenth week when a hypertonic condition of the muscles became very marked in the nonirradiated group with evidence of emaciation and senility. The irradiated group became slightly emaciated, but showed no muscular tenseness.

At the end of the experiment the femurs of the animals on the nonirradiated ration contained 54.1 and the irradiated 57.4 percent ash, while those of the initial and final controls contained 64.9 and 64.1 percent, respectively. The corresponding values for serum calcium were 7.5, 10.9, 11.7, and 11.9 and for inorganic phosphorus 6, 6, 6.6, and 5.3 mg. per 100 cc, respectively. Irradiation of the diet appeared to have a favorable effect upon oestrus.

It is noted in conclusion that as the basal diet was not optimal with respect to protein or phosphorus content, the favorable effects of vitamin D on calcium conservation might have been increased if the diet had been improved in these respects as well.

III. *The effect of vitamin D on the teeth of rats* (pp. 217–224).—This paper reports observations on the teeth of the animals in the studies reported in the two previous papers, with the following summary:

"A stock rat ration which was unable to maintain normal ash content of bone in female rats during lactation did not lead to depletion of minerals in the incisor teeth, and liberal additions of vitamin D correspondingly had no effect on the teeth. However, a ration low in calcium when fed to adults over a long period of time was unable to maintain normal composition of teeth or bone even without the strain of reproduction. The sole addition of vitamin D resulted in almost complete protection against mineral losses, as revealed by analysis for ash and histological examination. For complete protection the ration was probably too low in calcium."

Relation of serum calcium to pathologic calcifications of hypervitaminosis D, A. Ham and B. C. Portuondo (*Arch. Path., 16 (1933), No. 1, pp. 1–14, figs. 3*).—"The present contribution is concerned with a study and interpretation of the evidence obtained by correlating the changes in the tissues with the serum calcium curves of animals during the time immediately following the administration of one single massive dose of activated ergosterol."

Following a single enormous dose of activated ergosterol, the serum calcium level of rats rose for a period of 2 or 3 days and then fell gradually. Pathological calcifications appeared in large numbers after the level of serum calcium had begun to fall. The rise in serum calcium level is attributed to the attraction of the parathyroid-controlled fraction of the serum calcium for the calcium obtained from the intestines, bones, and other tissues, and the fall to a release of calcium from the fraction controlled by the parathyroid hormone. As the serum is capable of retaining only a small amount of calcium in simple solution, precipitation occurs in the tissues. This precipitation is thought to be more dependent upon the state of the serum calcium than upon its level.

"Although the calcification of hypervitaminosis D may be explained by a shift in calcium from the blood to the tissues, it is possible that other features of the lesions, such as necrosis and infiltration by inflammatory cells, may be caused primarily by a disturbance in the calcium balance between the cells and tissue fluids. This balance conceivably is disturbed on the upswing of the serum calcium curve because of withdrawal of calcium from the tissues. Thus the cause of the calcifications may not be identical with the cause of the necrosis and infiltration by inflammatory cells."

TEXTILES AND CLOTHING

Fibre-length irregularity in cotton, N. Ahmad and H. Navkal (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. B, No. 16 (1933), pp. [2]+10*).—The fiber length irregularity is defined as the percentage ratio by weight of all the fibers in a representative sample which measure less than three fourths of the modal length. Values of fiber length irregularity are given for 63 standard Indian cottons and 30 agricultural samples. Results for the standard cottons and the simple correlation coefficient between mean fiber length and irregularity show that the comparatively long cottons tend to be somewhat more irregular than the short ones. Correlation coefficients between the highest standard warp counts, the mean fiber length, the fiber weight per inch, and fiber length irregularity are given. Inclusion of fiber length irregularity did not raise the multiple correlation coefficient between the highest standard warp counts and mean fiber length and fiber weight per inch. The present method is compared with that described by Clegg (E.S.R., 68, p. 282), for calculating a similar property termed percentage short hairs.

Effect of weave on the properties of cloth, H. F. Schiefer, R. S. Cleveland, J. W. Porter, and J. Miller (*[U.S.] Bur. Standards Jour. Res., 11 (1933), No. 4, pp. 441–451, figs. 8*).—The effect of weave on strength, elongation, take-up, tear resistance, fabric assistance, and air permeability of cloth was studied in a series of 42 cloths woven from the same cotton yarns in weaves comprising plain, twill, rib, mock leno, basket, sateen, and various combinations of these weaves.

In general, a cloth which is closely woven and firm and has a large number of thread interlacings per unit area and short floats has a greater strength, elongation, and take-up and a lower tear resistance and air permeability than a cloth of the same weight which is loosely woven, sleazy, and has fewer thread interlacings per unit area and long floats. The strength and elongation decrease as the tear resistance is increased. Factors contributing to strength and tear resistance are enumerated and discussed. Rubberizing and doping increased the strength and decreased the tear resistance and permeability. A cloth of initially high tear resistance retains its high tear resistance relative to a cloth of initially low tear resistance.

Analysis of wool-cotton textiles, R. T. Mease and D. A. Jessup ([*U.S.*] *Bur. Standards Jour. Res., 12 (1934), No. 1, pp. 75–86, figs. 2*).—A study of several methods for the determination of cotton and wool in mixtures showed the inadequacy of certain methods. In a procedure described as satisfactory, sizing, finishing materials, and natural nonfibrous constituents of the textiles are removed by solvent extraction, followed by digestion with a starch-hydrolyzing enzyme and washing. The wool is determined directly by weighing after removal of the cotton by carbonization with aluminum chloride, and the cotton by weighing after removal of the wool with potassium hydroxide. Results accurate within 1 percent of the amount of total dry fiber present were readily obtainable by this method.

HOME MANAGEMENT AND EQUIPMENT

Comparison of schedule and account methods of collecting data on family living, C. G. Woodhouse and F. M. Williams (*U.S. Dept. Agr., Tech. Bul. 386 (1933), pp. 43*).—This bulletin, which has been prepared particularly for research workers in standards of living, reports and discusses in considerable detail the results of a comparison of the reliability of the two most common methods of securing data on family living, (1) the account method, in which a day by day record of receipts and expenditures is kept by the homemaker or other member of the family and (2) the schedule method, in which information is obtained from each family in one or two personal interviews with the use of a schedule provided for the entry of the data by a field agent. The data were obtained from 40 farm families in four different States, including the 13 families reported on in Vermont Experiment Station Bulletin 294 (E.S.R., 62, p. 298), and 24 families of the professional group living in cities. Day by day records were kept by each of these families and at the end of the year schedule estimates covering the same period were secured. For the families from one State preliminary schedules covering the year before the accounts were begun were also secured, and as an additional check schedule estimates were secured for the same time from other farm families in the State keeping household accounts.

The data obtained by the various methods were compared item by item for the farm and professional groups separately. Owing to slight differences in methods followed in the farm family studies in the different States, these were also reported by States. The significance of variations in the items reported by the two methods was determined statistically by use of the formula $t=\frac{x\sqrt{n}}{s}$ in which $\bar{x}$= the average difference between the account and schedule figures for a given item, n=the number of differences, and s=the standard deviation of the differences between the account and schedule figures from individual families. The general conclusions are summarized as follows:

"The results from the small samples of families included in this study indicate that with families similar in education and in purchasing procedures to the professional group cooperating in the present study, the schedule apparently can be made a satisfactory method of securing data on family expenditures and savings. If an analysis of the nutritional content of the diet of such a group is to be made a part of the project, the results of this investigation indicate that the schedules should be supplemented by records of food consumption. With farm families similar to those cooperating in this study, the schedule could perhaps be made a satisfactory method of securing data on family expenditures and savings. However, for the purpose of obtaining satisfactory data on the value of family living furnished by the farm, and on the quantities of foods consumed by farm families, it is apparent that accounts kept for short periods at different seasons in the year should be used to check the accuracy of the schedule data."

A list of 18 references to the literature is appended.

MISCELLANEOUS

Alaska Agricultural College and School of Mines Agricultural Experiment Station, College, Alaska, 1932: Progress report, January–December, G. W. GASSER (*Alaska Col. Sta. Bul. 2 (1932), pp. 40, figs. 8*).—The experimental work reported is for the most part noted elsewhere in this issue.

Forty-fourth Annual Report of the Kentucky Agricultural Experiment Station for the year 1931, II (*Kentucky Sta. Rpt. 1931, pt. 2, pp. [2]+587, figs. 62*).—This contains reprints of Bulletins 314–325, all of which have been previously noted.

Experimental projects: Thirty-ninth Annual Report [of the Montana Station], 1932, F. B. LINFIELD (*Montana Sta. Rpt. 1932, pp. 32, figs. 2*).—The various projects under way at the station and substations are enumerated. Meteorological data are also included.

Forty-sixth Annual Report [of Pennsylvania Station], 1933, [R. L. WATTS ET AL.] (*Pennsylvania Sta. Bul. 293 (1933), pp. 43, figs. 11*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

NOTES

Georgia College.—A division of plant pathology has been established in charge of J. H. Miller. Work in plant breeding is also being offered under this division by T. J. Harrold, assistant professor of horticulture.

U. H. Davenport has been appointed associate professor of agricultural engineering.

Iowa College.—According to a note in *Science*, an allotment of $70,000 has been made by the Federal Public Works Administration for the erection on the campus of a building to house the agricultural byproducts laboratory of the U.S.D.A. Bureau of Chemistry and Soils. Construction of this building is to be begun immediately. The work of the laboratory on farm wastes and related problems is also to be considerably amplified.

Kansas College and Station.—Leave of absence has been granted to R. M. Green, professor of agricultural economics, to serve as vice president of the Production Credit Corporation of Wichita, and to C. A. Logan, assistant professor of agricultural engineering, to assist in the soil erosion control project of the U.S. Department of the Interior.

Dr. Edgar L. Tague, professor of chemistry and assistant in protein investigations in the station, died while at work on January 11. Dr. Tague was born in Indiana in 1873 and educated at the University of Kansas, receiving the B.S., M.S., and Ph.D. degrees in 1907, 1911, and 1924. He was assistant professor of chemistry in the same institution in 1911 and professor of chemistry in Washburn College from 1912 to 1913. Coming to the Kansas Station in 1914 as assistant chemist, he also became assistant professor of chemistry in the college in 1916, associate professor in 1920, and professor since 1931. His research work had included extensive studies in colloid chemistry, the hydrogen-ion concentration of extracts of flour and silage, the proteins of milk, the action of ultraviolet rays on proteins, and changes in eggs in storage.

Maryland University.—William Lee Amoss, director of farmers' institutes in Maryland from 1896 to 1910 and president of the American Association of Farmers' Institute Workers in 1902, died December 9, 1933, at the age of 74 years. Mr. Amoss organized the Maryland State System of Farmers' Institutes and so conducted them as to make them highly educational in character. After retiring from this work he was connected with several commercial farm enterprises and, following the World War, with the U.S. Department of Labor in the placement of discharged soldiers. In recent years he had devoted himself to his own farm in Harford County. He presented his agricultural library to the university.

Kenneth A Clark, extension specialist in animal husbandry, has resigned to accept the management of a group of farms in Frederick County and has been succeeded by J. M. Vial.

Missouri University and Station.—The facilities of the station have recently been improved by the purchase of a 450-acre farm near Columbia, which will be used primarily by the departments of dairy husbandry and animal husbandry. This farm adjoins the tract that was acquired about two years ago for investigations in soils and field crops. These additions to the station equipment are expected to facilitate the development of a number of projects formerly deemed impossible because of the lack of adequate land.

E. A. Trowbridge, chairman of the department of animal husbandry, has been granted leave of absence to August 31 in order to accept an appointment as special agent of the Production Credit Division of the Federal Farm Credit Administration, with headquarters in Washington, D.C. During this period L. A. Weaver, professor of animal husbandry, is serving as acting chairman. Hopewell D. Fox and Albert J. Dyer have been appointed assistants in animal husbandry, effective January 1.

Paul L. Piercy has been appointed instructor in veterinary science, effective January 1.

Nebraska Station.—A machine shed at the North Platte Substation, valued at $2,000 and destroyed by wind, is being rebuilt. Through the use of C.W.A. funds a rather comprehensive program of road improvement is also under way at this substation.

Cornell University.—Quarters and equipment have been installed on the Arnot Forest of the university for maintenance as a winter camp of the U.S. Civilian Conservation Corps with about 200 men. Roads and bridges are being built to make the tract more accessible, and improvement cuttings, replanting, and similar work will be undertaken, thereby greatly adding to the value of the forest for demonstration and research purposes.

North Carolina College.—Dr. W. B. Cobb, head of the soils department since 1924, died in Chicago on November 22, 1933, after a brief illness which began during his attendance at the annual meeting of the American Soil Survey Association, of which he was a former president. Dr. Cobb was born in Cambridge, Mass., November 23, 1891, and educated at the University of North Carolina, receiving the A.B. degree in 1912, the A.M. degree in 1913, and the Ph.D degree in 1927. He was connected with the U.S.D.A. Soil Survey from 1913 to 1918 and again following the World War, in which he participated in the U.S. Army Air Service. From 1920 to 1924 he was associate professor of agronomy in charge of soils at the Louisiana University. He was a member of the American organizing committee of the First International Congress of Soil Science and had come to be recognized as an authority on soil classification. At the time of his death he had two books under way, one on pedology and the other on the soils of North Carolina. While not a member of the station staff, he had collaborated in its soils work and had just completed a manuscript on the origin and development of North Carolina soils, now in press as a part of a station publication on soil evaluation for agricultural purposes.

Tennessee University.—Morrill Hall was completely destroyed by fire on January 18, with a loss estimated at $300,000, of which $225,000 is represented by the contents of the building, including a collection of 30,000 botanical specimens in process of assembly since 1875.

Vermont University.—Harry C. Norcross, county agent for Grand Isle County, has been appointed extension economist in farm managment.

Tenth World Dairy Congress.—Announcement has been made that this Congress will open at Roma on April 30 and close at Milano on May 6. It is expected that about 60 countries will participate in the Congress. Sections will be organized on cattle and milk production, milk and its byproducts as food, the industry and commerce of milk and its byproducts, veterinary questions connected with milk, and tropical dairying. An international exhibition of livestock and appliances will also be held during the Congress at Firenze (Florence).

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EDITORIAL

OBJECTIVES IN AGRICULTURAL RESEARCH

By B. YOUNGBLOOD, *Principal Economist, Office of Experiment Stations*

A traditional activity of the Office of Experiment Stations which facilitates its administrative relations with the State agricultural experiment stations and its efforts to promote State-Federal cooperation is that of keeping in touch with developments and trends in agricultural research. Factual information essential to this continuous inquiry into the processes and achievements of research is drawn from a diversity of sources. Research publications abstracted for *Experiment Station Record* disclose evidences of scientific advancement. State station projects proposed reflect improvements in methodology, objectives, and cooperative relations between State and Federal agencies.

In addition, first-hand knowledge of the functioning of research is gained in course of the annual examinations of projects and expenditures under Federally-provided funds at each of the State stations. Representatives of the Office making these examinations are also accorded an opportunity to observe the progress of projects carried on State, local, and endowment funds. Conferences are held with administrative officers upon such questions pertaining to research as may arise. These varied contacts with the research personnel, projects, and findings are not only enlightening but highly valuable in efforts to improve research as a means of advancing agriculture and rural life.

As in practically every other type of human endeavor, the depression has left in its wake some difficult administrative problems for those responsible for the successful performance of agricultural research. While State legislatures were being forced to make often drastic curtailments in supporting funds, the nation-wide effort to restore prosperity was creating the strongest and most diversified demand for those types of technical, economic, and social guidance which come from research ever made upon agricultural institutions.

At the outset, it was realized that to restore prosperity would require scientific teamwork on a scale never attempted before. Collective thought and concerted action on the part of both State and Federal research agencies would be the minimum requirement for success. As the Federal Department of Agriculture assumed leadership in the solution of national problems, the State agricultural experiment stations provided leadership in the solution of local and regional problems. In the headway already made the wisdom of autonomous State and Federal research agencies united in the spirit of cooperation for the common good is more than verified.

From their small beginnings the institutions of agricultural research and education have had one common objective which did not have to be modified with time and experience, aside from changes of emphasis in the approach to its attainment. This objective is better farming, better real and monetary incomes, and better rural living. How the research agencies have sought to attain this ultimate objective has depended, in part, upon the development of an adequate body of sufficiently diversified research and, in part, upon rural and public demands for certain types of research specified in agricultural legislation and in consequence necessarily adhered to rather closely. Nevertheless, by improving the vision of prospective and less evident needs of agriculture and rural life, the research agencies have exerted a decided influence upon the breadth of public opinion and the trend of agricultural legislation, both State and Federal.

Considered from the viewpoint of emphasis, the year 1900 marks an important turning point in the history of American agricultural research. Prior to that year the recognized business of the research agencies was to solve problems encountered on the farm, and problems affecting the farmer arising off the farm were regarded as outside their sphere. What was attempted was to provide farmers with information that would enable them to lessen the physical burdens of farming, maintain soil fertility, improve upon the diversity, quality, and yield of crop and livestock products, and protect these products against the ravages of diseases and insect pests. Both farmer and public opinion supported the hypothesis that better farming would lead to better income and better rural living.

The depression of the 90's brought important changes. Public discussion of the economic questions of the day led the nation to realize as never before that some of the farmers' problems were economic and social, although there was no general recognition that these problems, like the physical and biological problems encountered on the farm, were susceptible of scientific study. However, some of the men engaged in agricultural research believed that the forces affecting farm income could be subjected to scientific analysis and synthesis and proceeded to demonstrate this proposition.

As in the case of natural science research, the study of the farmer's economic questions began on the farm or, at most, in the farmer's community. At the Minnesota Station, Drs. W. M. Hays and Andrew

Boss began preliminary studies of cost of production before 1900, and by 1901 were pursuing an organized project on the study of farm management by the cost accounting method in cooperation with the United States Department of Agriculture. In the same decade Dr. G. F. Warren was studying farm management by the survey method at Cornell, Dr. W. J. Spillman was establishing an Office of Farm Management Investigations in the United States Department of Agriculture, and Drs. H. C. Taylor and B. H. Hibbard were launching economic studies in agricultural credits and marketing at the Wisconsin Station. Within a few years these two viewpoints had met on common ground and united for the purpose of making such additional studies as might enable farmers to improve their incomes. In the past twenty years agricultural economics research has amassed in many respects a remarkable body of knowledge, and public opinion has come to accept this field as an essential part of agricultural research. The agricultural colleges and universities of the country were not slow to include agricultural economics and related subjects in their curricula, and from their classrooms have come many men and women now recognized as the nation's agricultural and rural life leaders.

Other fields that have been added to the nation's research program since 1900 are home economics and rural sociology. The rural homemaker, originally neglected, has in recent years begun to receive many of the services of science in dealing with her home problems. As with farming, some of these problems involve natural science while others require economic or sociological solutions. In necessitating a return to a greater amount of rural self-sufficiency, the present depression has served to emphasize the importance of more adequate and better diversified research in this field.

Rural sociology has been rather slow to receive public recognition and support, in part because of its name, in part because of its newness, in part because of a lack of research talent until recent years, and in part because it deals with less tangible though no less vitally important problems than those under the older types of research. The future of this field of research is very promising because of recent advances in methodology and a growing appreciation on the part of the nation of the social importance of subordinating prices and profits to human values and social well-being. Hereafter, therefore, the problems of rural life as a part of the pattern of national life will undoubtedly receive greater emphasis both in public esteem and in programs of agricultural research.

Obviously, these agencies were not established full grown. Like civilization itself, research is a matter of progressive evolvement. Its present proportions are the result of gradual accretion from small beginnings. Natural science research was the first to be applied to the solution of American agricultural problems. Natural science problems were the only problems recognized at the time as susceptible of scientific solution and, coincidentally, natural scientists—physicists, chemists, botanists, entomologists—were the only scientists generally recognized as available and capable of solving farm problems. As rural economic and social problems came to the fore and were recognized as amenable to scientific discipline, these fields were added to the research program.

One type of science, or its agricultural application, grows out of another. Agricultural physics of the early days, for example, has become agricultural engineering and soil physics; early studies of cost of production have become agricultural economics, including farm management, marketing, prices, land utilization, agricultural finance, credits, and taxation. A similar division of labor or specialization has occurred in the early-day applications. One of the first essentials to successful research is to develop a sufficient diversity of specialists to insure adequate attention to particular problems. Now that talent is more generally available, the effort is for specialists to organize their inquiries around major objectives.

As the nation has evolved and science has grown, the relative importance of different types of farm problems has changed, and the nation's research program has decidedly improved in both scope and function. In times of emergency, these agencies are frequently criticized either for attempting to anticipate prospective demands for rural information or for failing to foresee these needs. Nevertheless these agencies have made remarkable progress over the past half century, not only in solving those types of problems presented to them by public demand but also in anticipating prospective needs for new types of information for which little if any public appreciation existed at the time. In these accomplishments the nationwide system of autonomous State and Federal research agencies is demonstrating its reliability as a means of promoting rural progress.

In the past this nation, along with the rest of the world, has doubtless over-emphasized production to the relative neglect of consumption problems. This is natural, since through the ages mankind has had real experience with the difficulties involved in producing enough, one year with another, to provide the necessities and some of the comforts of life. With great emergencies, the need may suddenly change. For example, less than twenty years ago the great national demand was for production research. Science was called upon to help produce foodstuffs and fibers with which to win the World War. The present emphasis upon economic and social research arose out of a breach in human relations throughout the world as a result of that war. Surpluses on the one hand and underconsumption on the other brought agriculture and rural life to the crossroads, and the nation is confronted with a new set of agricultural problems requiring a better vision of objectives, new emphasis, and new approaches to their solution.

Everything considered, agricultural research in the United States has proven remarkably flexible and responsive to rural human needs. With due allowance for overlapping, the following is the order in which these needs have come to be recognized and studied: First, the physical; second, the biological; third, the economic; and, fourth, the sociological. In none of these stages of evolvement has finality been attained. In all of them, there is room for improvement but apparently more on the side of consuming and living than on that of production.

Heretofore better farming may have been sought at the expense of real income and human values. If so, the present depression should improve the nation's vision of both ultimate objectives and the scope and function of agricultural research. Public opinion should improve and, with experience, become less backward and more forward-looking. A more complete body of knowledge pertaining to agriculture and rural life and their relative position in the national picture will be required. More information concerning marketing, exchange, distribution, and consumption will be demanded. Consumption will be studied from physical, biological, economic, and sociological viewpoints, and production will be studied relative to the requirements of consumption. Studies of both production and consumption will be conditioned upon their contribution towards the attainment of human objectives.

Out of this more adequate body of agricultural knowledge should come a better balanced national economy—a better balance between agriculture and industry, between self-sufficing and commercialized agriculture, and between earning and living.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Annual review of biochemistry, I, II, edited by J. M. Luck (*Stanford Univ., Calif.: Stanford Univ. Press, 1932, vol. 1, pp. VII+724, figs. 4; 1933, vol. 2, pp. VIII+564*).—The first of these volumes consists of a series of reviews of current developments in from 25 to 30 of the major fields of interest in biochemistry. "Guided by the principle that critical analyses and résumés would be of greater value, attention has been centered, in most instances, upon selected aspects of the particular topic under review, and every effort has been made to discuss, as adequately as space permitted, the most significant contributions to the subject. In consequence, other fields of major interest, even though embraced by one or another of the topics contained in the volume, have been deliberately omitted for the present. It is fully expected that such omissions will be remedied by adequate consideration in future volumes, in which such topics may simply alternate from year to year with some of those now receiving treatment."

Among the topics selected for this volume are the following: Biological Oxidations and Reductions, by R. Wurmser (pp. 55–68); Enzymes, by E. Waldschmidt-Leitz (pp. 69–88); The Chemistry and Metabolism of the Compounds of Sulfur, by H. B. Lewis (pp. 171–186); The Chemistry and Metabolism of the Compounds of Phosphorus, by H. D. Kay (pp. 187–212); Carbohydrate Metabolism, by P. A. Shaffer and E. Ronzoni (pp. 247–266); Fat Metabolism, by W. R. Bloor (pp. 267–298); The Metabolism of Proteins and Amino Acids, by J. M. Luck (pp. 299–318); Nutrition, by A. H. Smith (pp. 319–336); Vitamins, by L. J. Harris (pp. 337–412); and The Hormones, by D. L. Thomson and J. B. Collip (pp. 413–430).

Included among the reviews in the second volume, covering chiefly the literature of 1932, are the following: The Chemistry and Metabolism of the Compounds of Sulfur, by H. B. Lewis (pp. 95–108); The Chemistry and Metabolism of the Nucleic Acids, Purines, and Pyrimidines, by L. R. Cerecedo (pp. 109–128); Carbohydrate Metabolism, by C. F. and G. T. Cori (pp. 129–146); Fat Metabolism, by W. R. Bloor (pp. 147–164); The Metabolism of Proteins and Amino Acids, by J. M. Luck (pp. 165–186); The Metabolism of Creatine and Creatinine, by W. C. Rose (pp. 187–206); Mineral Metabolism—Calcium and Magnesium, by A. T. Shohl (pp. 207–230); The Hormones, by D. L. Thomson and J. B. Collip (pp. 231–252); Vitamins, by L. J. Harris (pp. 253–298); and Nutrition, by A. H. Smith (pp. 299–316).

[Chemical and technological research of the Bureau of Chemistry and Soils] (*U.S. Dept. Agr., Bur. Chem. and Soils Rpt., 1933, pp. 10–12, 13, 14, 15–17, 18–23, 24–26.*)—Results are briefly noted of studies on the utilization of cull sweetpotatoes for starch, storing sugarcane, farm-made sirups, honey, the waxy coating of apples and other fruits, the effect of light on foods, frost damage, preservation of fruit juices, food preservation by freezing and fermentation, color investigations, treatment of canvas and other cotton fabrics and leather to increase fire, water, and mildew resistance, hides, skins, and tanning materials, destructive distillation of corncobs and pecan shells, fermentation of waste sugar-beet pulp, composition of pine gums and apricot-kernel oil, use of salmon oil in feeding, and utilization of sugarcane bagasse.

Chemical investigations of the tobacco plant, H. B. VICKERY, G. W. PUCHER, A. J. WAKEMAN, and C. S. LEAVENWORTH (*Carnegie Inst. Wash. Pub. 445 (1933), pp. 77, figs. 12*).—This monograph is a contribution from the Connecticut [New Haven] Experiment Station. Of its three parts the first, chemical changes that occur in leaves of Connecticut shade-grown tobacco during early stages of curing, is an extension of Bulletin 324 (E.S.R., 65, p. 36). It considers the preparation of the material, analytical methods, expression of the data, and changes in color during curing, in water and solids, and in distribution of nitrogen.

Part 2, dealing with chemical changes that occur in leaves of Connecticut shade-grown tobacco during culture in distilled water, covers changes in water and solids, and in distribution of nitrogen; together with a discussion and comparison with the curing experiments and a summary.

Part 3, on the determination of carbohydrates in tobacco leaf extract, considers the inversion of sucrose, preparation of solution, determination of total reduction, and determination of fermentable sugar.

A general bibliography is appended.

The liquid wax of seeds of Simmondsia californica, R. A. GREENE and E. O. FOSTER (*Bot. Gaz., 94 (1933), No. 4, pp. 826–828*).—A contribution from the University of Arizona reports the analysis of a liquid wax, obtained in a yield of from 25 to 30 percent by hydraulic pressure, from the seed of the species mentioned. The analysis, which was made with a view to determining if the product has commercial possibilities, yielded the following data as to the properties and proximate composition: Sp. gr. 25° C., 0.8635; refractive index (Abbé) (25°), 1.4650; iodine number (Hanus), 88.40; Reichert-Meissl number, 0.70;Polenske number, 0.31; acid value, 0.23; soluble acids (as butyric), 2.43 percent; insoluble acids, 59.43 percent; unsaponifiable residue, 37.62 percent; saponification number, 95.00; and acetyl number, 6.80. It is noted that the characteristics and constants here listed "agree very closely with those of sperm oil and arctic sperm oil." Qualitative tests indicated a probability that the liquid wax consists largely of fatty acid decyl esters.

An improved method for the preparation of dihydroxyacetone, A. I. VIRTANEN and M. NORDLUND (*Biochem. Jour., 27 (1933), No. 2, pp. 442–444*).—Finding that the direct crystallization of the triose from the products of the growth of *B[acillus] dioxyacetonicum* or of *Acetobacter suboxydans* in glycerol solutions by first precipitating the greater part of the impurities with alcohol and ether and then evaporating under diminished pressure does not yield pure dihydroxyacetone—the product containing traces of unfermented glycerol and other impurities causing a yellow color and a tendency to remain sirupy—the authors propose a method of which the essential feature is the conversion of the entire quantity of the triose into its bisulfite derivative, from which glycerol and other impurities are extracted by careful washing with alcohol. The solutions in which the organism—*A. suboxydans*—had been grown were centrifuged, evaporated to a sirup in shallow layers at room temperature under a strong current of air from an electric fan, 100 cc of alcohol and 40 cc of ether were added to each 100 cc of the sirup, the alcohol-ether filtrate was again concentrated to a sirup, and, after neutralizing with sodium hydroxide, was treated with 1.16 parts of sodium hydrogen sulfite for every 1 part of the triose shown by a quantitative determination to be present, and the precipitation of the bisulfite compound was completed by chilling to from 0° to 4° C. and adding cold alcohol. The crystalline mass thus precipitated was thoroughly washed with alcohol. By this means the dihydroxyacetone determined to be present was quantitatively recovered. Details of the decomposition of the bisulfite compound with dilute sulfuric acid and the recovery of the triose in pure, crystalline form are given. About 80 percent of the triose formed could be recovered in crystalline form, but about one half of this was lost in a form which could not again be crystallized in the final washing with absolute alcohol. The yield of the finally purified triose was about 35 percent on the basis of the glycerol used.

A note on the desorption of n-butylamine from charcoal, H. J. Phelps and R. B. Vallender (*Biochem. Jour., 27 (1933), No. 2, pp. 435–441, figs. 2*).—The desorption of *n*-butylamine from charcoal by pure water and by an equivoluminal mixture of water and alcohol was found to be a two-stage process in either case. There was first a period of very rapid desorption during which alcohol-water mixtures extracted about twice as much adsorbed base as does pure water. The rapid phase of desorption attained kinetic equilibrium in a few minutes, and was succeeded by a much slower process of desorption which continued with constant velocity for many hours. The slower process was considerably accelerated by rise of temperature, and at 0° was immeasurably slow. The velocities and temperature coefficients of the slow secondary desorption process were the same in pure water as in alcohol-water mixtures. "It is concluded that two different types of adsorption complex exist in the charcoal, one being far more stable than the other."

The reaction between naphthalene-2-sulphonic chloride and some thiol compounds, B. C. Saunders (*Biochem. Jour., 27 (1933), No. 2, pp. 397–402*).—Both the reduced and oxidized forms of glutathione were found to reduce naphthalene-2-sulfonic chloride to naphthalene-2-sulfinic acid in the presence of an alkali, the yield of sulfinic acid in each case pointing to the formation of a disulfoxide of glutathione.

Naphthalene-2-sulfonic chloride acted upon cysteine in two ways, first oxidizing the amino acid quantitatively to cystine with the formation of the theoretical equivalent of naphthalene-2-sulfinic acid and, second, in accordance with the usual action of the reagent upon amino acids, forming a di-(naphthalene-2-sulfonyl-) cystine by reacting with both amino groups of the cystine. On the other hand, "if the —SH group in cysteine is blocked as in *S*-benzylcysteine, then naphthalenesulfonic chloride gives a quantitative yield of *N*-naphthalene-2-sulfonyl-*S*-benzylcysteine, no sulfinic acid being formed."

In a reaction analogous to that of the conversion of cysteine into cystine, thiolacetic acid was oxidized to dithioglycolic acid with the concomitant formation of a theoretical yield of naphthalene-2-sulfinic acid.

A new synthesis of 2-thiolhistidine together with experiments towards the synthesis of ergothioneine, C. R. Harington and J. Overhoff (*Biochem. Jour., 27 (1933), No. 2, pp. 338–344*).—Aspartic acid was found to be converted by boiling acetic anhydride into an azlactone; this, in turn, yielded an acid chloride on treatment with phosphorus pentachloride in acetyl chloride; and treatment of the acid chloride with diazomethane in anhydrous ether gave a fair yield of ethyl α-acetamido-γ-keto-δ-chlorovalerate. This compound, on heating in anhydrous xylene with freshly prepared potassium phthalimide, gave ethyl α-acetamido-γ-keto-δ-phthalimidovalerate, which was hydrolyzed by boiling with 20 percent hydrochloric acid; and the resulting αδ-diamino-γ-ketovaleric acid monohydrochloride, dissolved in water and treated on a boiling water bath with sodium thiocyanate, yielded the desired thioamino acid, which was made to crystallize out rapidly by adding a saturated solution of sodium acetate after the completion of the reaction until the reaction mixture was no longer acid to Congo red. Because of the racemization of the aspartic acid in the first stage of the synthesis, *dl*-2-thiolhistidine, rather than the levorotatory compound, was obtained.

Glucose dehydrogenase: Preparation and some properties of the enzyme and its coenzyme, D. C. HARRISON (*Biochem. Jour., 27 (1933), No. 2, pp. 382–386*).—The author describes in working detail a method whereby he was enabled to extract from liver stable, concentrated preparations of glucose dehydrogenase, together with preparations of the coenzyme practically free from protein, and, like the dehydrogenase preparations, almost free from pigment. Some observations on the properties of the enzyme-coenzyme system are also recorded.

Yeast-growth stimulants in white sugars, H. H. HALL, L. H. JAMES, and L. S. STUART (*Indus. and Engin. Chem., 25 (1933), No. 9, pp. 1052–1054*).—In a number of samples of white sugar, studied with reference to their suitability for use in the manufacture of food products, the authors of this contribution from the U.S.D.A. Bureau of Chemistry and Soils demonstrated the presence of substances stimulative of yeast growth. The extent of the stimulation varied widely. Yeast crops of from 1 to 58.5 times the quantity added as an inoculum were produced in 10 percent sugar solutions. The growth stimulating substances were shown to be present in very small quantities, to consist of organic compounds containing nitrogen, and to be soluble in 80 percent alcohol.

The utilization of certain sugars and their derivatives by bacteria, S. A. KOSER and F. SAUNDERS (*Jour. Bact., 26 (1933), No. 5, pp. 475–488*).—Methyl sugars in which the methyl group replaces a hydroxyl hydrogen at carbon atom 1 were distinctly resistant to bacteria. Alpha-methyl-*d*-glucoside was utilized by comparatively few of the micro-organisms which ferment glucose. Alpha-methyl-*d*-mannoside, beta-methyl-*l*-arbinoside and beta-methyl-*d*-xyloside were not fermented by those organisms capable of breaking down *d*-mannose, *l*-arabinose, and *d*-xylose. The *d*-form of arabinose was fermented much more slowly than the common *l*-form by most bacteria. On the other hand, the methyl pentoses, rhamnose, and fucose, in which the methyl group is attached to the fifth carbon atom, were fermented readily. Two sugars containing seven carbon atoms, alpha glucoheptose and alpha glucoheptulose, were not fermented by any of the organisms tested. Glucosamine was used by most of the cultures which utilized glucose, though in some instances apparently with more difficulty. Gluconic acid was used by many of the bacteria. A sulfur-containing sugar, glucose ethyl mercaptal, gave entirely negative results.

Butyric acid and butyl alcohol fermentation of hemicellulose- and starch-rich materials, S. A. WAKSMAN and D. KIRSH (*Indus. and Engin. Chem., 25 (1933), No. 9, pp. 1036–1041*).—The authors of this contribution from the New Jersey Experiment Stations isolated from soils certain anaerobic types, assigned to the *Clostridium butyricum*, Prazmowski, group, and shown to be capable of fermenting some of the hemicelluloses, as well as the starches and sugars of some plant materials with the formation of alcohols and organic acids—mainly butyric acid and butyl alcohol. Wheat middlings gave a good yield of fermentation products, but corn meal was not readily fermented. The addition of concentrated corn-steep liquor exerted a markedly favorable effect on the fermentation processes, especially in the case of the corn meal, from which a good yield of butyl alcohol was obtained. Other plant products and plant materials, e.g., molasses, alfalfa, and corncobs, supported good growth of the organisms, but the fermentation process was not vigorous. Purified hemicelluloses were not fermented; in the process of separation and purification, they were rendered resistant to decomposition by these organisms.

Inhibition of the growth and metabolism of the acetic fermentation organisms [trans. title], H. Quéré (*Compt. Rend. Soc. Biol. [Paris] 110 (1932), No. 25, pp. 958, 959*).—The substances most effective in inhibiting the growth of the organism considered were liposoluble substances. Bromoacetic methyl ester, for example, was found 10 times as powerful an inhibitor both of growth and of respiration as was the acid, the ester inhibiting growth at a concentration of N/4,000 and respiration at a concentration of N/200, whereas the corresponding figures for the free acid were N/400 and N/20. The amyl and octyl esters of this acid were even more effective (N/7,000 and N/6,000). Hexylresorcinol was found 500 times as active as resorcinol. The most active substance studied was allyl isothiocyanate, which inhibited yeast growth at a concentration of N/100,000. Various other substances are also discussed.

The effect of inoculation on the quality, chemical composition, and bacterial flora of sauerkraut, C. S. Pederson (*New York State Sta. Tech. Bul. 216 (1933), pp. 21, figs. 10*).—The effect on the quality, chemical composition, and bacterial flora of sauerkraut produced by the addition of various starters to the shredded cabbage when packed was studied. "Thirty-nine krauts were prepared, using a starter (inoculum) consisting of various mixtures of pure cultures of *Streptococcus lactis* (Lister) Löhnis, *Leuconostoc mesenterioides* (Cienkowski) Van Tieghem, *Lactobacillus pentoaceticus* Fred, Peterson, and Davenport, and *L. cucumeris* Bergey et al. Thirty-one krauts were prepared using starters composed of juice obtained from tanks of kraut undergoing normal fermentation."

The use of a mixture of pure cultures as a starter was shown to be of doubtful value. Inocula consisting primarily of cultures of *S. lactis* or *Leuconostoc mesenterioides* were most successful. The fermentation in such cases was similar to a normal fermentation. Starters consisting primarily of the lactic rod forms (*Lactobacillus pentoaceticus* and *L. cucumeris*) were shown to have a definitely detrimental effect.

When starters consisting of kraut juice containing 0.3 percent or more of acid were used, the kraut produced was shown usually to be of a quality poorer than that of normal kraut. "When starters containing less than 0.25 percent acid were used, the resulting kraut was apparently normal, but no definitely beneficial effects were noted." It was shown that kraut may ferment abnormally after being inoculated from the juice adhering to the sides of the vats from the previous fermentation.

Synthesis of perhydro-vitamin A.—Purification of vitamin A preparations [trans. title], P. Karrer and R. Morf (*Helvetica Chim. Acta, 16 (1933), No. 4, pp. 625–641*).—Various steps are given for the synthesis of perhydrovitamin A, with evidence that the product is identical with that formed by the catalytic reduction of vitamin A. It is noted that in the last two years vitamin A concentrates have been prepared from four different fish oils and that the various preparations show similar constants.

On the ultra-violet absorption of crystalline preparations of vitamin B_1, R. A. Peters (*Roy. Soc. [London] Proc., Ser. B., 113 (1933), No. B 780, pp. 48–56, figs. 4*).—Attention is called to the fact that evidence has been reported by several investigators, including Bowden and Snow (E.S.R., 67, p. 500), Windaus et al. (E.S.R., 67, p. 101), Heyroth and Loofbourow (E.S.R., 69, p. 325), and Ohdake (E.S.R., 69, p. 6), to the effect that vitamin B_1 has an ultraviolet absorption band with a maximum at 260 mμ, but that the highly potent preparations of Kinnersly, O'Brien, and Peters (E.S.R., 70, p. 153) have their maximum absorption at from 245 to 249 mμ, with only a barely perceptible increase in absorption at 260 mμ. In an attempt to connect this discrepancy with a possible effect of H-ion concentration, it was found that when an acid solution of the vitamin was brought suddenly to about pH 13 a broad band appeared at 330–340 mμ, together with an increase in absorption at shorter wave length, usually with a maximum at about 233 mμ. On heating the solution for 2 minutes in a water bath the 330 mμ band disappeared, and on making the solution acid the original absorption at 245 mμ was restored with practically undiminished intensity. The cycle could be repeated with qualitatively the same results, although even after a single cycle the vitamin B_1 activity was substantially reduced.

The possibility is suggested that the substance responsible for the 245 mμ band in the original preparation is not vitamin B_1. The fact that the preparation examined absorbed about twice as intensely at 245 mμ as that of Windaus et al. at 260 mμ is thought to suggest the possibility that a considerable quantity of the 260 mμ band is present, together with the absorption at 245 mμ.

Vitamin C (ascorbic acid) as activator for the cathepeptic enzyme, I [trans. title], P. Karrer and F. Zehender (*Helvetica Chim. Acta, 16 (1933), No. 4, pp. 701–703*).—Ascorbic acid obtained from fresh swine liver was found to catalyze the hydrolysis of gelatin by cathepsin, as shown by the increase in NH_3 nitrogen as determined by the Van Slyke methed.

Structural formula of ergosterol, A. L. Bacharach (*Analyst, 58 (1933), No. 691, p. 605*).—Supplementing a previously noted paper (E.S.R., 69, p. 631), the most generally accepted structural formula of anhydrous ergosterol is presented.

A sensitive hydrometer for estimating total solids in irrigation waters and soil extracts, A. N. Puri (*Soil Sci., 36 (1933), No. 4, pp. 297–301, figs. 3*).—The author describes two instruments, of which the first, for laboratory measurements to be made under conditions permitting the use of simultaneous readings in distilled water as a basis of calculation and affording suitable protection for a delicate glass instrument, utilizes the principle of the scaleless stem and the reading of the position of the instrument by means of a needlepoint extending from the tip of the stem into a graduated tube, as presented in a previous contribution (E.S.R., 67, p. 212).

The second type of hydrometer, designed for field work under conditions not permitting the use of distilled water as a comparison standard, is made up of a body or "spindle" of nickel-plated brass, a stem which may be unscrewed to permit the adjustment of the lead shot weighting of the instrument to bring it to a zero reading at 35° C., and a screw cap fitting into the tip of the stem and provided with a set of interchangeable weighting wires for giving the instrument a zero reading at each degree of temperature from 35° down to 15° or lower. "If the temperature is slightly higher or lower than that corresponding to the temperature correction wire, a positive or negative correction is applied to the hydrometer reading. The temperature should be read with a thermometer reading to 0.2 of a degree." The scale of this type of instrument is engraved on the stem.

A graph accompanying the paper shows an essentially linear relation between soil extract solid content and hydrometer readings.

Notes on the determination of insoluble phosphoric acid in fertilizers, O. W. Ford and H. R. Kraybill (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 653–660*).—The authors of this contribution from the Indiana Experiment Station conclude, in part, that "in the usual commercial fertilizers in which precipitated tricalcium phosphate is present as indicated by the use of anhydrous ammonia, ammonia liquor, or lime, or where bone meal is used, the proposed method gives lower results for insoluble phosphoric acid than does the Official method. It is believed that this proposed method more closely approximates the availability of these fertilizers to plants.

"It is important to choose suitable paper for filtering the insoluble from the neutral ammonium citrate solution following digestion. Some of the filter papers studied are suitable for use in the analysis of the usual commercial fertilizers while others are very unsatisfactory. While ammonium chloride may be used satisfactorily in the case of rock phosphate with the usual commercial fertilizers, the use of ammonium chloride in the washing of the insoluble phosphoric acid residue is unsafe. None of the filter papers examined was found to be satisfactory for filtering the insoluble residue from precipitated tricalcium phosphates. There is need for a better method of filtration for such materials as bone ash, precipitated tricalcium phosphate, etc."

An absorption apparatus for the micro-determination of certain volatile substances, I, II (*Biochem. Jour., 27 (1933), No. 2, pp. 419–429, figs. 3; pp. 430–434*).—The first of the two papers here noted describes apparatus, method, and checks conducted with solutions of known ammonia content; the second, the application of the method to various biological materials.

I. *The micro-determination of ammonia*, E. J. Conway and A. Byrne.—The very simple apparatus described consists of a shallow vessel having the form of a small Petri dish but with thick walls and an inner chamber formed by an inner wall concentric with the outer and arising to about one half the height of the outer wall. The glass from which this apparatus is made must be incapable of releasing alkali to the acid placed in the inner chamber. The upper edge of the outer wall is ground so that it may be tightly covered by a flat glass plate greased with vaseline. The form of the apparatus of which a drawing is shown has a wall thickness of 5 mm. The inside height of the outer wall is 10 mm, of the inner chamber 5 mm, and the inside diameters of the outer and inner chambers are, respectively, 61 and 35 mm.

The absorbing acid was prepared by dilution from exactly normal sulfuric acid. It was found especially convenient to make up the acid with 20 percent alcohol so that the indicator—a methyl red-methylene blue mixture—could be added to the acid to form a stable reagent. Detailed directions for preparing a methyl red-methylene blue mixture turning sharply from pink at pH 5.45 to green at pH 5.50 are included.

With reference to the efficiency of the apparatus, it was shown that "an absorption of 99.5 percent of the ammonia content of 1 cc of fluid is established in less than 1½ hours at room temperature and in less than 1 hour at 38° [C.]. . . . The coefficient of variation of the individual estimation as obtained from a large number of analyses is 0.5 percent, this accuracy of analysis being practically maintained with amounts as small as 0.014 mg ammonia-nitrogen. An advantage of the method is that a large number of estimations (upwards of 50) can be carried out simultaneously."

II. *The determination of urea and ammonia in body fluids*, E. J. Conway.—The procedure for the determination of urea in 0.2 cc samples of body fluids, by treatment with a phosphate-urease reagent and absorption of the liberated ammonia as above described, is detailed.

The determination of cystine in biological material, F. T. G. Prunty (*Biochem. Jour., 27 (1933), No. 2, pp. 387–390*).—The method of M. X. Sullivan,[1] based upon the reaction of cysteine with sodium β-naphthoquinonesulfonate to form a colored compound capable of colorimetric estimation and found by its author to give recoveries of cystine only from 50 to 75 percent of that present when the cystine was reduced in the presence of the reagents used in the colorimetric method itself, was shown by the author of the paper here noted to give accurate results if the cystine were reduced by means of zinc dust in acid solution to cysteine prior to the application of the colorimetric reaction itself.

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[1] Pub. Health Rpts. [U.S.], 41 (1926), No. 22, pp. 1030–1056.

The advantages and disadvantages of a number of methods, including that of Folin and Looney (E.S.R., 47, p. 504), are discussed. The results of determinations of the cystine content of various substances by the new method are stated.

The determination of chloride in blood, J. H. Norris and G. Ampt (*Biochem. Jour., 27 (1933), No. 2, pp. 321–325*).—The authors destroyed organic matter by fusion with sodium hydroxide, finding that their procedure obviated the chloride losses which they had observed to be of frequent occurrence in the destruction of the organic matter by acid oxidation methods. They note, as the special advantages of the fusion with alkali, that their method provides a simple technic, carried out in apparatus not readily broken; that they were able to secure invariable reproducibility of results; and that the method has an end point sensitiveness of one drop of 0.02 N thiocyanate solution, the equivalent of 0.06 mg of sodium chloride. Sodium chloride added in the form of its approximately 0.05 N solution to a mixture of gum and oil and dried therewith before the alkali fusion yielded chloride equivalent to from 5.97 to 6.03 mg of sodium chloride as against 6.03 mg actually added.

Determination of l-malic acid in fruits and fruit products, B. G. Hartmann and F. Hillig (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 645–653*).—The method for the determination of malic acid in fruits and fruit products described in this contribution from the U.S.D.A. Food and Drug Administration depends upon the isolation of the acid by means of lead acetate and its purification by reprecipitation with tribasic lead acetate reagent, of which the preparation is described. These precipitations must be preceded by the precipitation of the pectin content of the original solution by the addition of alcohol.

"The procedure is time-consuming, though easy of application. The final solution for the polarimetric measurement of the acid is colorless, so that no difficulty is experienced in obtaining concordant readings."

Excellent recoveries of malic acid from its mixtures with tartaric acid, citric acid, and succinic acid are shown. The necessary procedure is described in working detail.

The determination of copper and iron in dairy products, W. Williams (*Jour. Dairy Res. [London], 3 (1931), No. 1, pp. 93–100*).—In this paper the author describes two colorimetric methods for determining copper in dairy products, namely, the xanthate and the sodium diethyl-dithio-carbamate. While both methods gave satisfactory results, the latter was more sensitive and less liable to error from possible contamination.

A colorimetric method for determining iron by a modification of the ferric thiocyanate method proved to give a high degree of accuracy. A method of wet ashing is described in which organic matter is oxidized by the use of concentrated sulfuric acid and sodium nitrate and copper and iron extracted from the fat.

Results are presented showing the amount of copper and iron contamination to which cream is subjected during the process of butter manufacture and the distribution of copper and iron in the cream, butter, and buttermilk.

Citric acid in milk, B. G. Hartmann and F. Hillig (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 643–645*).—The application of the Stahre reaction for the determination of the citric acid content of fruits and of products made from them having been shown by the authors of this contribution from the U.S.D.A. Food and Drug Administration (E.S.R., 64, p. 511) to be quite reliable, they have now developed a modification of the method suitable for the determination of the citric acid content of milk, in which the acid is present in the form of its sparingly soluble calcium salt.

"The liberation of citric acid is accomplished by decomposition with sulfuric acid; the casein and albumin of the milk are removed with phosphotungstic acid. After the removal of the sugar, the citric acid is precipitated as pentabromacetone. It was found that the addition of tartaric acid assisted in the precipitation of lead citrate. In principle, the method is that described by the authors for the determination of citric acid in fruits and fruit products."

The procedure as modified for application to milk is given in full working detail, and data indicating its highly satisfactory accuracy are tabulated.

Methods of estimation of salt in cheese, F. H. McDowall and L. A. Whelan (*Jour. Dairy Res. [London], 2 (1931), No. 2, pp. 184–189*).—The Massey Agricultural College, New Zealand, made a study of the various available methods for estimating the salt in cheese. Three methods were found to give concordant results and permitted accurate estimation of known added amounts of chloride. The methods were as follows: (1) Careful ashing with small amounts of potassium nitrate, after the addition of some dilute caustic soda, and subsequent titration of chloride; (2) solution of cheese in caustic soda, precipitation of the proteins by nitric acid, and titration of chloride in an aliquot portion of the filtrate; and (3) titration of chloride after destruction of the proteins by hot nitric acid in the presence of excess silver nitrate.

The history of staining, H. J. Conn (*Geneva, N.Y.: Biol. Stain Comn., 1933. pp. 141, figs. 9*).—By reason of the fact that such historical notes on biological staining methods as have been published are both scattered over a wide range of publications and, in most instances, are limited to individual technics, the editor of this collection of papers felt that "there seemed to be some call for a broader but less detailed historical discussion that might be of interest to the general student in histology or cytology. . . . No effort has been made in this series of papers to treat the history of any one field exhaustively. It has seemed that the book would be more valuable to the general student of histology if it should cover the entire history of staining in a somewhat sketchy manner rather than to give the technical details of any man's work, which would be of little interest to those not specializing in the same line. Each chapter, however, is followed by a series of references which can be consulted by anyone desiring more detail." The contents include the pioneers in staining, Sir John Hill, Joseph von Gerlach, cochineal dyes, logwood dyes, Rudolf Heidenhain, Paul Mayer, aniline dyes in histology, Paul G. Unna, the development of bacteriological staining methods, Paul Ehrlich, the development of cytological staining, Walther Flemming, the staining of blood and parasitic protozoa, John Belling, the use of dyes as vital stains, and Gustav Mann.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [July–August 1933] (*U.S. Mo. Weather Rev., 61 (1933), Nos. 7, pp. 189–218, pls. 14, fig. 1; 8, pp. 219–249, pls. 12, figs. 5*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific

Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 7.—American Pioneers in Meteorology, by E. R. Miller (pp. 189–193); A Brief List of Works on Meteorology, compiled by C. F. Talman (pp. 194, 195); Weather Types and Pressure Anomalies, by T. A. Blair (pp. 196, 197); The Upward Speed of an Air Current Necessary to Sustain a Hailstone, by G. Grimminger (pp. 198–200); A Brilliant Meteor and Its Cloud-like Trail, by S. P. Peterson (p. 200); Tropical Disturbances of July 1933, by C. L. Mitchell (pp. 200, 201); The Dallas, Tex., Tornado of July 30, 1933, by G. E. Dunn (p. 201); and Excessive Rainfall of July 22–25, 1933, in Louisiana and Extreme Eastern Texas, by R. A. Dyke (pp. 202, 203).

No. 8.—Investigations of Atmospheric Periodicities at the Geophysical Institute, Leipzig, Germany, by B. Haurwitz (pp. 219–221) (see below); Wet and Dry Periods in Puerto Rico, 1899–1932, by C. L. Ray (pp. 222, 223) (see below); Storm Types and Resultant Precipitation in the San Diego Area, by D. Blake (pp. 223–225); Hourly Frequency and Intensity of Rainfall at San Francisco, Calif., by R. C. Counts, Jr. (pp. 225–228); Nacreous and Noctilucent Clouds, by W. J. Humphreys (pp. 228, 229); Morning Showers Over the Gulf, and Afternoon Showers in the Interior Near Corpus Christi, Tex., by J. P. McAuliffe (p. 229); [Solar Radiation Measurements at the Blue Hill Meteorological Observatory], by H. H. Kimball (pp. 230–232); What is the Effect of Heavy Rains with High Winds on the Run of Cup-Wheel Anemometers? by C. F. Marvin (p. 233); and Tropical Disturbances of August 1933, by R. H. Weightman (pp. 233–235).

Investigations of atmospheric periodicities at the Geophysical Institute, Leipzig, Germany, B. Haurwitz (*U.S. Mo. Weather Rev., 61 (1933), No. 8, pp. 219–221, figs. 4*).—A short account is given in this article of methods and results of periodicity studies at the Geophysical Institute of Leipzig since 1923, particularly of a wave having a period of 24 days, the starting point of which "was the discovery that in barograms there sometimes appear points (the so-called points of symmetry) with respect to which pressure changes before and after are surprisingly symmetrical." The results indicated that the 24-day period represents a pulsation of the cold polar air masses. Comparison of the behavior of the wave at mountain and neighboring valley stations showed that its amplitudes decrease rapidly with the elevation. "In other words, the pressure change is to be explained by temperature changes in the intermediate layer. Thus the pronounced decrease of the amplitude of the 24-daily wave is a result of its thermal nature."

Wet and dry periods in Puerto Rico, 1899–1932, C. L. Ray (*U.S. Mo. Weather Rev., 61 (1933), No. 8, pp. 222, 223*).—This paper gives a chronological classification of wet and dry years in the northern, eastern, southern, and western sections of Puerto Rico. It is shown that "in the south portion droughts are somewhat more frequent than in the east, owing to the east-west course of the mountains, which therefore cause the heavier rains to occur in the north and east parts of the island." There appears to be "no well-defined relationship between the rainfall of Puerto Rico and that of the United States, except perhaps in years of wide-spread and severe drought."

The crop climate of Georgia, P. Tabor (*Ga. Agr. Col. Bul. 435 (1933), pp. 34, figs. 13*).—This is a report of a study of the characteristic features of the climate of Georgia with special reference to crop production, based on data published by the U.S. Weather Bureau and recorded at the experiment stations at Athens and Tifton. The monthly and annual productive temperatures for various annual and perennial crop plants are shown for different climatic zones of the State. The principal field, horticultural, and forest plants suited to the State are arranged in temperature groups on the basis of their observed growth in Georgia and elsewhere.

It is stated that the temperature of Georgia is suited to the production of most of the world's annual crops, but that it is not so favorable for perennial crops. "Rapid maturing varieties without extended winter resting periods are needed. . . . A combination of two or more annual crops of different temperature requirements may be grown in the same field in Georgia, due to the excess of productive temperatures for most crops. An example is corn with interplanted cowpeas, velvet beans, peanuts, or crotalaria. The corn completes its growth early and the pricipal development of the interplanted crop follows, thus avoiding serious competition. The lack of sufficient rainfall for both crops prevents universal adoption of this practice. . . . The average rainfall of Georgia is adequate for good yields. It is highly variable during the fall and to a lesser extent in spring and summer. This variability produces a need for drought-resisting crops during spring, summer, and fall on the average hill lands of the State, except the northeastern mountain region."

SOILS—FERTILIZERS

[Soil work of the Bureau of Chemistry and Soils] (*U.S. Dept. Agr., Bur. Chem. and Soils Rpt., 1933, pp. 8, 9, 32–50*).—Results of studies of soil erosion, magnesium and zinc deficiency in soils, soil fertility, fertilizers (including manganese sulfate, fertilizers for strawberries, cotton, sugar beets, sugarcane, and potatoes), humus compounds in soils, soil microbiology, urea synthesis, peat as a nitrogen carrier, potash and phosphoric acid studies, and mixed-fertilizer technology.

[Soil investigations of the Bureau of Plant Industry] (*U.S. Dept. Agr., Bur. Plant Indus. Rpt., 1933, pp. 22, 23*).—The report notes the importance of determining the quantity of salts carried into irrigated lands by the irrigation water as compared with that removed by drainage, and indicates methods of combating boron toxicity.

[Soil Survey Reports, 1928 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 32, pp. 41, fig. 1, map 1; 33, pp. 35, pl. 1, fig. 1, map 1*).—These reports were prepared with the respective cooperation of the Indiana and Texas Experiment Stations.

No. 32, Part 1. *Soil survey of Blackford County, Indiana*, W. E. Tharp and S. R. Bacon (pp. 1–27).—Blackford County, in east-central Indiana, contains 107,520 acres of very gently undulating plain, of which about 90 percent is open farm land, the remainder for the most part small wood lots. Natural drainage required to be supplemented by tile and ditches, but "the present systems of surface drainage reach every farm, and only a few small depressions have no outlet."

Crosby silty clay loam, 44.7 percent of the total area surveyed, is the most extensive of 12 types, here assigned to 10 series, and Brookston silty clay loam constitutes a further 33.7 percent.

No. 32, Part 2. *The management of Blackford County soils*, A. T. Wiancko and S. D. Conner (pp. 29–41.—This section deals with the chemical composition and management of these soils.

No. 33. *Soil survey of Van Zandt County, Texas*, A. W. Goke et al.—Van Zandt County soil consists of 547,840 acres of northeastern Texas, forming a high rolling plain. A drainage system generally adequate but liable to spring overflow consists of streams lying "but little below the surface of the bottom lands."

The soils are classified in 19 series, inclusive of 28 types. Susquehanna fine sandy loam forms 25.2 percent of the county; Bowie fine sandy loam, 12.1 percent; and Norfolk fine sand, 10.4 percent.

Potassium in calcareous soils, I, II, W. T. McGeorge (*Arizona Sta. Tech. Bul. 50 (1933), pp. 42, figs. 10*).—The two parts of this bulletin report upon studies, respectively, of the solubility and availability of the local calcareous soils, and on certain of the properties of the replaceable potassium of such soils.

I. *Solubility and availability.*—The Arizona soils to which reference is made were found to contain much reserve potassium. The replaceable potassium content showed widely varying values, but the soils of lowest replaceable potassium content did not respond to additions of this element, and "the indications are that luxury consumption will take place in many."

The solubility in water was found very low in some cases, but the absorbed potassium was so readily made soluble by the action of carbon dioxide that low solubility in water was not found to handicap the absorption by the crop, provided root respiration is normal.

In most of the local soils under discussion available potassium showed a decrease with soil depth, as did also the solubility of potassium in water. The subsoils showed a potassium fixing power such that, by fixation of potassium leached from the surface soil, the supply of available potassium in the subsoil increases with cultivation.

II. *Some properties of replaceable potassium.*—"Exchange potassium is readily replaced from calcareous soils by 0.1 N solutions of ammonium salts but not by calcium salts, while in noncalcareous soils the two salts are equally effective. Calcium salts depress the hydrolysis of potassium zeolite and increase fixation of potassium in calcareous soils, but not in noncalcareous soils. Calcareous material in soils depresses the solubility of soil potassium below the theoretical value found by Magistad [E.S.R., 60, p. 515]. . . . [On the other hand] neutral calcium salts will show an active initial liberation of potassium from calcareous soils."

"Calcareous soils in Arizona show high Neubauer [E.S.R., 50, p. 118] values for potassium. Neubauer values for calcareous and noncalcareous soils containing equivalent amounts of replaceable potassium are higher for the former.

"Solubility of replaceable potassium in calcareous and noncalcareous soils of equivalent replaceable potassium content are higher in the latter.

"Holding calcareous soils for an extended period in a puddled condition does not change the replaceability of potassium. Loss of replaceable potassium by leaching with pure water is small for calcareous soils.

"Heating calcareous soils increased replaceable potassium up to 750° C. in a sandy loam, while there was little change in a silty clay loam.

"Grinding calcareous soils in a ball mill increased the replaceability of potassium practically threefold. Grinding a peat soil had no effect on replaceability of potassium. Grinding increases the exchange capacity of the inorganic exchange complex, but does not alter the exchange capacity of organic colloids."

Theories offering a possible explanation of the greater availability of potassium in calcareous soils and supporting the postulate that they contain a large part of their potassium adsorbed by noncrystalline colloids, either in the form of synthetic zeolite-like compounds or isoelectric precipitates, are put forward.

Absorption of potassium by plants in relation to replaceable, nonreplaceable, and soil solution potassium, D. R. Hoagland and J. C. Martin (*Soil Sci., 36 (1933), No. 1, pp. 1–33, pl. 1, figs. 8*).—In the experiments recorded in this contribution from the University of California, attention was directed especially to the capacity of soils to supply the potassium requirements of plants as related to the replaceable, the nonreplaceable, and the soil solution potassium content of the soil.

"When the amount of replaceable potassium is high, all or the major portion of the potassium absorbed by the crop may be balanced by loss of replaceable potassium from the soil. High replaceable potassium tends to induce 'luxury' consumption of this element by the crop. As cropping continues, the proportion of potassium derived from nonreplaceable form grows larger until a point is reached at which no further loss of replaceable potassium can occur, at which point the solubility of the nonreplaceable form determines the supplying power of the soil. In some soils, this may be adequate for crop growth, but in other soils, the solubility of the nonreplaceable form is too low and plants suffer from a deficiency of potassium."

Though many of the soils studied could remove added potassium from its solution almost entirely, it was none the less possible to demonstrate some increase in the soil solution potassium content after treatment even with small quantities of potassium salts. "Certain soils had the power to fix a large amount of potassium in nonreplaceable form immediately after fertilization of of the soil. In other soils, all potassium added was recoverable by leaching the soil with ammonium acetate. The possibility is suggested that under some soil conditions, influences incident to crop growth may, in some unknown manner, cause some of the potassium added to the soil to go into nonreplaceable form. In certain cases, a portion of the potassium added to the soil was not recoverable in the crop, over long periods of intensive cropping." Attention is called to the importance of considering differences among soils in fixing power for potassium in connection with attempted fertilization of deep-rooted crops.

The soil solution was usually found to contain at any one time only a very small part of the total growth cycle crop absorption.

Minimum adequate potassium concentrations in soil solutions and artificial culture solutions were found to be of very similar general magnitudes; but "when solutions of intermediate concentration derived from different soils were compared, no consistent relation between concentration and amount of potassium absorbed by crops was found, although in a given soil treated with varying amounts of potassium salts the relations were consistent." Under suitably controlled conditions the potassium-supplying capacity of the soil was found to be indicated by the chemical composition of the crop. "A striking interrelationship between calcium, magnesium, and potassiun" was observed, but "crop growth is not limited by specific ratios of bases."

A tentative schematic outline for the clarification of some of the interrelationships between soil and plant with respect to potassium is presented.

Contribution to our knowledge of the chemical nature and origin of humus, III, IV, S. A. Waksman and K. R. N. Iyer (*Soil Sci., 36 (1933), No. 1, pp. 57–67, fig. 1; 69–82*).—The two papers here noted from the New Jersey Experiment Stations (E.S.R., 68, p. 163), take up the preparation of complexes of wheat straw alkali lignin with various proteins, and compare the chemistry and microbiology of the behavior of these complexes in soils with those of the natural soil humus.

III. *The base-exchange capacity of "synthesized humus" (ligno-protein) and of "natural humus" complexes.*—Lignoproteins or "artificial humus" complexes were found to have a base-exchange capacity much greater than that of free lignin, the lignogliadin complex in which the components were combined in the ratio 4 : 1, for example, showing a base-exchange capacity about seven times the sum of the capacities of its components. The base-exchange capacity of the artificial complexes increased with the protein content. It was affected also by the nature of the base used in the preparation of the complex, the calcium complex having the highest capacity, the iron preparation an intermediate value, and the aluminum the lowest. The drying of these artificial complexes only slightly reduced their base-exchange capacity.

Humus preparations from peats showed a base-exchange capacity distinctly greater than that of like preparations extracted from mineral soils.

IV. *Fixation of proteins by lignins and formation of complexes resistant to microbial decomposition.*—"Proteins are capable of forming with lignins, in different proportions, complexes which render them more resistant to attack by microorganisms. The greater the protein content of the complex the more readily can it be decomposed and, vice versa, the greater the proportion of lignin to protein the less readily is the latter subject to decomposition." The formation of such complexes was found to occur gradually, "resulting from the intimate contact of the lignin with the protein; it is markedly influenced by certain factors, such as drying, temperature, reaction, and presence of bases."

Of observations concerning the microbial decomposition of the lignoprotein or humus nucleus, it is noted that "lignoprotein complexes are subject to greater decomposition by micro-organisms in a fresh than in an air-dry state; drying of these complexes renders them considerably more resistant to rapid decomposition. The decomposition of the lignoprotein complexes in the humus depends upon the relative ratio of the lignin to the protein in the complex, upon the conditions under which this was formed, its combination with bases, the nature of the inorganic part of the soil, soil conditions, and the presence of specific micro-organisms."

The relation of elevation to the nitrogen content of grassland and forest soils in the Rocky Mountains of Colorado, R. D. Hockensmith and E. Tucker (*Soil Sci., 36 (1933), No. 1, pp. 41–45*).—In soil samples obtained from various altitudes in the Rocky Mountain region from Fort Collins to the Continental Divide, this contribution from the Colorado Experiment Station reports a total nitrogen content higher in the surface 3 in. of forest soils than in the corresponding layer of grassland soils. However, the nitrogen content of the grassland soils in the layers at depths of from to 3 to 6 in. and from 6 to 12 in. was greater than that of the corresponding layers in the forest soils.

With reference to the relation of soil nitrogen to the height at which the samples were taken, it was observed that "in general the nitrogen content of the soil increases with an increase in elevation, although above 10,000 ft. it varies considerably," these fluctuations being attributed rather to variations in the quantity of vegetation than to the difference in rate of decomposition. "Since in higher altitudes rainfall increases and temperature decreases, the nitrogen-altitude relation observed is in agreement with known nitrogen-climate relationships [E.S.R., 65, p. 20]."

Soluble aluminum studies.—III, The relationship of nitrification and sulfur oxidation to the aluminum and hydrogen-ion concentration of some very acid soils, G. G. Pohlman (*Soil Sci., 36 (1933), No. 1, pp. 47–55, fig. 1*).—Experiments designed to show the relationship of nitrification and sulfur oxidation to the H-ion concentration and aluminum content of the soil solution of 18 very acid soils, and presented in extension of work previously noted (E.S.R., 68, p. 741), indicated that:

"Nitrification and sulfur oxidation were effective in bringing aluminum into solution in soils, the displaced solution of which varied from pH 4.95 to 3.90. Nitrification was not prevented by concentrations of aluminum present in the soil solution of any of the soils studied. Nitrification took place in one soil which had an initial concentration of 27.25 p.p.m. aluminum and a final concentration of 190.0 p.p.m. aluminum. Nitrification was found to take place in one soil at pH 3.90, and was also probably the principal agent in reducing the pH of another soil to 3.50. A marked correlation (r=0.858) was found to exist between the calcium and nitrate-nitrogen contents of the soil solutions studied. These results indicate that in soils the process of nitrification is limited principally by the amount of calcium available as well as by the acidity of the soil.

"Sulfur oxidation was not prevented by concentrations of aluminum in the soil solution up to 27.25 p.p.m., the highest amount present in any of the soils at the beginning of the experiment.

"Biological activities in the soil reduced the pH of the soil solution from several of the soils below 3.6, the lowest values being 3.33 in a soil treated with sulfur and 3.50 in a soil treated with ammonium sulfate."

The fixation of air nitrogen by the bacteria of leguminous plants [trans. title], H. Burgevin (*Compt. Rend. Acad. Sci.* [*Paris*], *196* (*1933*), *No. 6, pp. 441–443*).—Two series of pot experiments with soybeans were set up, each representing various rates of application of ammonium nitrate, one series inoculated with *Bacterium radicicola*, the other not.

The inoculated series showed a noteworthy rate of nitrogen fixation, but the fixation rate was shown not to be appreciably affected even by the larger proportions of ammonium nitrate. Even in the presence of abundant mineral nitrogen, atmospheric nitrogen was freely utilized. The inoculated plants appeared much healthier than the noninoculated. It is concluded that a small application of mineral nitrogen to stimulate the initial growth of leguminous plants is good practice.

The electrophoretic potential of Rhizobium meliloti, R. P. Tittsler, M. W. Lisse, and R. L. Ferguson (*Jour. Bact.*, *23* (*1932*), *No. 6, pp. 481–489*).—*R. meliloti*, like other bacteria, shows, when suspended in distilled water, a negative electrophoretic potential.

Variations in the migration velocities of various strains as great as 100 percent were observed; and a relationship between electrophoretic potential and nitrogen-fixing ability is suggested, in that both the Northrop-Kunitz and the Falk capillary methods showed that the high nitrogen-fixing strains (with one exception, appearing in the Northrop-Kunitz method only) had a greater negative electrophoretic potential than those of lower ability. The results obtained with the Northrop-Kunitz electrophoresis method agreed, in general, with those of the Falk capillary method.

Calcium chloride, in $\frac{1}{10}$ M concentration very markedly depressed the electrophoretic migration velocity.

Green manure crops, H. B. Sprague (*N.J. Agr.*, *15* (*1933*), *No. 5, pp. 7, 8*).—"A 4-year average of the results obtained in this test shows clearly the advantage of legumes over nonlegumes." The plowing under of a rye crop actually decreased the yield of a following crop of corn, despite the application of 400 lb. to the acre of a 4–12–4 fertilizer.

The influence of green manure and organic residues on nitrogen fixation in soil, S. V. Desai (*Indian Jour. Agr. Sci.*, *3* (*1933*), *No. 2, pp. 301–319*).—By means of experiments on 100-g portions of soils or solution cultures and on potted soils in which plants were grown, the author determined the effect of green organic matter and of farmyard manures on the fixation of nitrogen in the presence of inocula of nitrogen-fixing organisms. The green material included maize, cowpeas, *Sesbania*, etc. Dry straw and fermented crop residues were also tested.

The author concludes that the fixation of nitrogen does take place when green manures, farmyard manure, straw, or other material are added to the soil under favorable conditions of temperature and moisture. The fermented tissues of nonleguminous plants were found more beneficial in this respect than those of leguminous plants.

Protein in feeding stuffs, A. W. Blair (*N.J. Agr., 15 (1933), No. 5, pp. 6, 7*).—This article summarizes some of the results of 35 years' work on the nitrogen content of a variety of crops as affected by lime, fertilizer, and manure treatments. It is concluded that it is "evident that the growing of legume crops on land that has been properly limed offers the best method of increasing the protein content of feeding materials. The proper use of nitrogenous fertilizers will also, under certain conditions, give some increase in the protein content of the crop."

Nitrogenous fertilizers, A. W. Blair (*N.J. Agr., 15 (1933), No. 1, pp. 2, 3*).—This is a brief popular discussion of the properties, adaptability to individual crops and soil conditions, and recoverability of the various inorganic sources of nitrogen, natural and artificial, and of organic nitrogenous materials.

A test of floats as fertilizer and a study of the influence of farm manure on their effectiveness, T. L. Lyon (*[New York] Cornell Sta. Bul. 574 (1933), pp. 18, fig. 1*).—On a Dunkirk silty clay loam experiment field at Ithaca and in Honeoye silt loam soil greenhouse pots floats ground from a soft Florida rock phosphate and superphosphate were compared with respect to their relative value both in immediate and in residual phosphating effects. On each soil both carriers of phosphorus were used in applications of varying amounts, and the progressive quantities of phosphorus carrier were supplemented on one hand by farm manure and on the other by nitrate of soda and muriate of potash. Tests on the Dunkirk soil covered a period of 16 years, those on the Honeoye soil involved 18 crops. The experiments on each soil type were divided into two periods. In the first, the direct effect of the phosphorus fertilizers was determined. In the second period, phosphorus applications were discontinued and their residual effect was measured.

In general, the results of the direct application, both with manure and with inorganic fertilizers, indicated that 1 lb. of superphosphate affected crop yield somewhat less than did 2 lb. of floats. Approximately this ratio obtained on both soil types, although there was a tendency to a somewhat narrower ratio on the Honeoye silt loam. In both soils applications of manure with the floats appeared to increase the availability of the phosphorus. The two soils show a very considerable difference in this respect, however, the manure exerting less effect on floats in the Honeoye than in the Dunkirk soil.

Both superphosphate and floats had a strong residual effect, although on the Dunkirk soil the residual effect of floats was relatively less than the direct effect. The crop response indicated that 1 lb. of floats was equal to 1 lb. of superphosphate in the residual effect in Honeoye silt loam, while more than 2 lb. of the floats were required to equal 1 lb. of superphosphate on the Dunkirk soil.

"On the whole, floats showed a relatively greater value, both direct and residual, on the Honeoye than on the Dunkirk soil. This difference in the effectiveness of floats on different soils may conceivably be a decisive factor in determining whether floats may be used profitably on a given soil."

A test was made on the Honeoye silt loam to ascertain whether the gypsum content of the superphosphate had a beneficial effect on crop growth which might have given superphosphate an advantage over floats in these experiments. The evidence of the test was that gypsum was not needed as amendment or plant nutrient on this soil.

The effect of depth of placement on the availability of superphosphate in calcareous soils, R. D. Hockensmith, R. Gardner, and A. Kezer (*Soil Sci., 36 (1933), No. 1, pp. 35–39, pl. 1*).—By means of experiments in which a phosphatic fertilizer was mixed with the upper 2 in. of soil samples placed in 5-gal. jars from which the drainage could be collected, the authors of this contribution from the Colorado Experiment Station were able to show that but very little of the phosphate passed through the calcareous soils under investigation. In another group of experiments, of which the results gave similar indications, the effect of depth of placement on the availability of superphosphate in a calcareous soil was determined by applying superphosphate at various depths in 5-gal. jars. After 65 days' growth the oven-dry weights of 16 out of the 48 plants grown in each jar showed (1) that there was no significant difference between the no treatment and the application of superphosphate at a depth of 0.5 in.; (2) that when the phosphate fertilizer was placed at 1 in. below the surface, 0.25 in. below the seed, there was a gain of 102.2 percent over no treatment; and (3) that the same quantity of fertilizer placed at a depth of 4 in. gave a gain of 179 percent over no treatment. "There was a barely significant increase in the 1,000-lb. application at 4 in. over the 300-lb. application at 4 in. The increase of the 1,000-lb. application at 6 in. over the 1,000-lb. application at 4 in. was not significant. . . .

"The failure to obtain a profitable response to superphosphate in some calcareous soils may be due to the improper placement of the fertilizer."

AGRICULTURAL BOTANY

Methods in plant histology, C. J. Chamberlain (*Chicago: Univ. Press, 1932, 5 ed., rev., pp. XIV+416, figs. 140*).—The fifth edition of this widely used manual is referred to as "a rewriting, not a mere revision." The steaming method of Kisser and Jeffrey's method of treatment with steam under pressure for the sectioning of hardwoods have been added, together with the Gourley procedure for the staining of living vascular tissue, and chapters by P. J. Sedgwick on photomicrographs and on motion-picture photomicrographs. Additional information has been added to the treatment of the paraffin method (though the use of butyl alcohol in this technic remains unmentioned), and improvements in section cutting, further refinements in important staining technics, etc., have also been included. The chapter headings of part 1 are: Apparatus, reagents, stains and staining, general remarks on staining, temporary mounts and microchemical tests, freehand sections, the glycerin method, the Venetian turpentine method, the paraffin method, the celloidin method, the cellulose acetate method, special methods, paleobotanical microtechnic, botanical photography, and illustrations for publication. Part 2, devoted mostly to specific directions for preparing mounts of representative plant structures, contains chapters on Myxomycetes and Schizophytes, Chlorophyceae, Phaeophyceae, Rhodophyceae, fungi, Bryophytes, Pteridophytes, Spermatophytes, using the microscope, labeling and cataloging preparations, a class list of preparations, and formulas for reagents.

Phytopathological and botanical research methods, T. E. Rawlins (*New York: John Wiley & Sons; London: Chapman & Hall, 1933, pp. IX+156, figs. 3*).—"In this book an attempt has been made to present methods which are of use to phytopathologists. Many of the methods are useful in other botanical sciences also." Transfers are more abrupt, however, and periods during which the material is left in the various reagents and grades of dehydration, clearing, infiltration, imbedding, etc., and in staining processes are much shorter than are those recommended, especially for cytological material, in the standard Methods in Plant Histology, above noted.

The manual is in three parts, of which the first deals with the choosing and planning of a research project. The second part, experimental methods, takes up certain of the methods of botanical microtechnic and microscopy, together with culture methods, virus studies, and miscellaneous experimental methods; and part 3 discusses the interpretation of experimental results. A classified bibliography of 960 entries is appended, together with a subject index.

Histological and regenerative studies on the flax seedling, D. M. Crooks (*Bot. Gaz., 95 (1933), No. 2, pp. 209–239, figs. 44*).—Supplementing studies of others on the histology, anatomy, and regeneration of flax seedlings, this paper deals in particular with the ontogeny of tissues and organs.

Anatomy of the transition region in Gossypium, A. M. Spieth (*Bot. Gaz., 95 (1933), No. 2, pp. 338–347, figs. 10*).—The root-stem transition region of cotton is described from studies on the Dixie Triumph variety in comparison with Acala, Cleveland 54, and Delfos.

Selective absorption of ions not confined to young rootlets, F. J. Crider (*Science, 78 (1933), No. 2017, p. 169*).—Contrary to the traditional view that selective absorption of ions by plants is entirely a function of the absorbing tissue of the youngest and most active rootlets and is confined to a more or less restricted zone lying close behind the subapical growing region and usually characterized by the presence of root hairs, experiments during 1932 at the Boyce Thompson Southwest Arboretum showed that by cutting off the young, unsuberized portion of *Citrus* and *Vitis* roots and carefully sealing the cut ends, selective absorption of phosphate and nitrate was found to take place in the woody parts of the roots. This was demonstrated for small seedling trees and for single roots of large trees growing both in the field and in concrete lysimeters. These experiments have now been extended to include a number of additional plants, and no exception has been found.

Investigations on the salt absorption of plants.—III, Quantitative relations between respiration and ion absorption [trans. title], H. Lundegårdh and H. Burström (*Biochem. Ztschr., 261 (1933), No. 4–6, pp. 235–251, figs. 4*).—An apparatus for measuring ionic removal and CO_2 production by the roots of wheat plants is described. The solutions bathing the roots contained the nitrates of Na, K, Mg, Ca, Ba (in M/400 and M/800), the chlorides of Li, Na, K, Rb, Cs, Mg, Ca (M/400–M/32,000), and the sulfates of Na, K, Mg, Ca (M/400 and M/800). The pH of the solutions was determined at the end of the experimental period, and the ionic analyses were performed spectrographically. The removal of anions exceeded the cation sorption. The difference was compensated by HCO_3- formation. Hence, the more easily diffusing anions stimulated CO_2 formation, accompanied by pH lowering. This additional respiration was considered an expression of the energy expended in anion sorption. The relative velocity of the latter was 3.7, 2.1, 1 for NO_3, Cl, and SO_4, respectively. Since the absorption of Ca is greater than that of Cl, while that of Cl is greater than that of K, it follows that a solution containing both salts will be balanced, i.e., will show a smaller pH change than each salt alone.—(*Courtesy Biol. Abs.*)

The utilization of atmospheric nitrogen by germinating seeds, [I], II [trans. title], N. Vita (*Biochem. Ztschr., 245 (1932), No. 1–3, pp. 210–217; 252 (1932), No. 4–6, pp. 278–291, figs. 18*).—The first paper in this series deals with observations on lupine seeds under unusual environmental conditions. Part 2 deals with observations on germination of pulse seeds in the presence of alkaloids.

The utilization of atmospheric nitrogen by germinating pulse seeds, III [trans. title], N. Vita and R. Sandrinelli (*Biochem. Ztschr., 255 (1932), No. 1–3, pp. 82–87*).—This continues the series noted above.

The influence of some stimulating materials on the nitrogen content of legumes during germination, IV [trans. title], N. Vita (*Gior. Biol. Appl. Indus. Chim. ed Aliment., 3 (1933), No. 2, pp. 41–51, figs. 4*).—Continuing the above series, comparison of the nitrogen fixing power and the oxidizing power of pea and lupine seed germinating in the following solutions, strychnine nitrate (1 percent and 2 percent solutions); caffeine nitrate (same concentration); and various metallic salts at the concentrations occurring in the ground, showed that generally a relation exists between these two properties.—(*Courtesy Biol. Abs.*)

Influence of temperature on the utilization of atmospheric nitrogen by legumes, V [trans. title], N. Vita and R. Sandrinelli (*Gior. Biol. Appl. Indus. Chim. ed Aliment., 3 (1933), No. 4, pp. 132–137*).—Continuing the above series as a fifth article, the influence of temperature on the utilization of elementary nitrogen by pea and lupine seed germinated in the presence of nitrate of strychnine or caffeine at 0.1 percent concentration was studied. The experiments showed that this utilization of nitrogen does not take place when germination occurs at a temperature lower than 10°, at least for all cases studied. The same utilization occurs when the temperature is maintained between 10° and 15°, but above 15° the temperature exerts a varying influence on the process, depending upon the seed and excitants.

Influence of some substances (especially unsaturated) on the enzyme activity of germinating seed of Ricinus, lipase and peroxidase [trans. title], M. Padoa and A. Spada (*Gior. Biol. Appl. Indus. Chim. ed Aliment., 3 (1933), No. 4, pp. 121–131, fig. 1*).—The acetate, cinnamate, and ricinoleate of ammonia caused a decrease in the lipase activity of *Ricinus* seed, while maleic acid and acetyl choline gave a slight increase and choline a decided increase. In a second series of experiments, maleic, fumaric, and succinic acids at 0.1 percent gave a lowered lipolytic activity, decreasing in the order named.

The technic used by Willstätter and Stoll to purify and concentrate the peroxidases of white rape was found to be exact, but it does not apply in the case of *Ricinus*. The authors have succeeded thus far only in concentrating, by evaporation and reduced pressure, to the point of obtaining an activity seven times greater than that of initial solutions. In this concentrated extract the peroxidase activity was augmented by the addition of α-alanine.

Biochemical investigation of tobacco curing and fermentation.—I, Changes in the hydrogen-ion concentration of tobacco during curing and fermentation [trans. title], J. Bodnar and B. Ladislaus (*Biochem. Ztschr., 247 (1932), No. 1–3, pp. 218–223*).—The pH and the ammonia content of high-grade cured samples of pipe, cigar, and cigarette types of leaf were studied before and during fermentation and in the green leaf of these tobaccos before curing. Half of each leaf, divided along the midrib, was used for direct analysis and the other half was fermented. The H-ion concentration in the leaf was found to decrease in curing and to increase during fermentation. The extent of acid formation during fermentation may be gaged by considering the ammonia formed in the process. The increase in H-ion concentration in fermentation may be attributed to the splitting of methyl alcohol from its ester in the pectin of the leaf.—(*Courtesy Biol. Abs.*)

The long and short wave-length limits of photosynthesis, G. R. Burns (*Science, 78 (1933), No. 2015, p. 130*).—This is a preliminary report from the

Vermont Experiment Station. The author developed a method of studying photosynthesis in various portions of the spectrum that seems to give reproducible and accurate results without interference from the secondary effects of the different wave lengths, consisting in a preliminary adjustment of the plant to the radiation intensity to be used. Actual determinations are made by exposing the plant to a steady source of one portion of the spectrum for two hours, determining the amount of carbon dioxide used, followed by exposure to such an intensity of a second portion of the spectrum that the amount of carbon dioxide used is the same as in the first case. The relative efficiencies of the two radiations are inversely proportional to their intensities.

Researches on plant respiration, I, II, W. STILES and W. LEACH (*Roy. Soc. [London], Proc., Ser. B, 111 (1932), No. B 772, pp. 338–355, figs. 6; 113 (1933), No. B 784, pp. 405–428*).—Two parts of this study are here reported.

I. *The course of respiration of Lathyrus odoratus during germination of the seed and the early development of the seedling.*—The output of carbon dioxide from germinating seeds and young seedlings of *L. odoratus* has been measured by means of the katharometer. By the use of this instrument the course of respiration of individual seeds can be followed. In the case of seeds retaining their testas this course is not simple but exhibits a series of phases corresponding to the various phases of germination. These phases are: (1) A fairly rapid increase in respiration rate as the seeds absorb water, (2) a period characterized by constant respiration rate of very variable duration, which continues until the seed coat is ruptured, (3) a very rapid rise in respiration rate following the rupture of the testas, (4) a period of approximately constant respiration rate when the latter is at a maximum, which is followed by (5) a phase of slowly diminishing respiration rate. Removal of the testas has the effect of largely eliminating phase 2, with the result that respiration rate continually rises to the maximum of phase 4.

A number of experiments performed with the object of finding a reason for the decline in respiration rate during phase 5 indicated that in older seedlings this decline in respiration rate is due, at least in part, to the conditions of experimentation which tend to a reduction in transpiration rate and so to a reduction in the rate of conveyance of respirable material from the cotyledons to the growing parts, and so to a limitation of the amount of respirable material available at the places where respiration is normally most active.

II. *Variations in the respiratory quotient during germination of seeds with different food reserves.*—The changes in the respiratory quotient during early development of seedlings of 10 species have been determined, and the relation between the values of the quotient and the nature of the food reserve of the seedlings are discussed. For each species the quotient exhibits a characteristic change in value throughout germination. In *Zea mays*, where the reserve is chiefly starch, the quotient is initially about unity, but falls regularly to a minimum of about 0.75, after which it rises slowly toward unity. *L. odoratus* and possibly *Pisum sativum* and *Vicia faba* exhibit comparable behavior. In *Fagopyrum esculentum*, also a starch seed, the quotient at a very early stage of germination is only about 0.5, but rises regularly and comparatively rapidly toward unity. In *Lupinus luteus*, which contains much hemicellulose and a little fat, the quotient remains for nearly 2 days at about 0.92 and then falls; in *Tropaeolum majus*, a hemicellulose seed containing a higher quantity of fat, the quotient is maintained at a lower level, about 0.75 for 10 or 11 days. Of the three species examined with seeds containing much fat, *Ricinus communis* exhibits a respiratory quotient which falls regularly from about 0.85 to 0.5 in about 5 days, whereas in *Helianthus annuus* the quotient rises from an early value of about 0.75 to a maximum of 0.85, after which it falls regularly. In

Cucurbita pepo the changes in the quotient are somewhat similar but at a higher level.

Wound compensation, transplantation, and chimeras in plants, N. P. Krenke, trans. by N. Busch, edited by O. Moritz (*Wundkompensation, Transplantation, und Chimären bei Pflanzen. Berlin: Julius Springer, 1933, pp. XVI+934, pls. 2, figs. 201*).—This German translation is based on Krenke's Russian work on "Surgery in Plants", but the revision and enlargement have been so extensive as to make the German edition essentially a new work, one and one half times the size of the original Russian text. The experimental phases of the subject are particularly emphasized, since the historical side had already been sufficiently covered by other authors.

Part 1 deals with the classification of the mechanical factors influencing plants—the natural mechanical factors: Natural disturbances of the plant as a whole; natural separation of plant parts; natural coalescence of plant parts (grafting, graft symbiosis, natural grafting); mechanical displacement of plant parts; and transitions to the artificial (surgical) influences (wind action). Part 2 takes up the artificial (surgical) influences: Reactions of cells and tissues to wounding (wound stimuli, traumatic tropisms, and related problems); wound healing and the replacement of lost parts (regeneration in plants v. animals, classification scheme and wound compensation forms in plants, and related matters); lost plant parts (basic problems of amputation regeneration, general and immediate causes of regeneration, mechanism of regeneration of amputated parts, regenerative power of various plant parts, minimal size of regenerated plant parts, significance of the ontogenetic stage for regeneration, life period of regenerated parts, regenerative power as a genetic character, variability in regenerated parts, artificial stimulation of regeneration, and a survey of the formation of cuttings); transplantation, including replanting and grafting (growth processes in grafts, limits and significance of grafting experiments, interrelationships of graft partners, grafting methods, and grafts on nonrooting cuttings); and chimeras (definition and classification—graft, stimulation, hybrid, and natural chimeras). Finally, there is a section on introduction of foreign materials into plants, including discussions of acquired immunity, inner therapy, and similar phenomena in plants.

The monograph ends with a comprehensive bibliography, indexes (1) of authors, (2) of genera and species referred to, and (3) of general subject matter.

Studies on the precipitin reaction in plants.—IV, The question of acquired reactions due to grafting, T. W. Whitaker and K. S. Chester (*Amer. Jour. Bot., 20 (1933), No. 5, pp. 297–308*).—In a previous series (E.S.R., 70, p. 309) 75 graft combinations consisting of representatives of 10 genera and 24 species of the Solanaceae have been tested for the presence of "acquired precipitins" after grafting. In this series of experiments not a single case has been discovered in which the "precipitin reaction" was appreciably greater after grafting than it was previous to grafting.

"The experiments reported above thus give no indication that as a result of grafting there is an acquired immunity of stock to scion or of scion to stock demonstrable by the 'precipitin' technic employed up to the present."

Studies on the "precipitin reaction" in plants.—V, Application to plant relationships, K. S. Chester, E. C. Abbe, and P. A. Vestal (*Jour. Arnold Arboretum, 14 (1933), No. 4, pp. 394–407*).—The present paper reports the results obtained in precipitation reaction tests of 45 species of Betulaceae, 1 species each of 5 other families of Amentiferae, 10 species of *Hypericum* (Guttiferae), and 2 species each of Iridaceae, Solanaceae, Oleaceae, Rosaceae, Caprifoliaceae, and Saxifragaceae. All precipitation tests made by earlier workers are summarized and an attempt is made to correlate them with studies in plant relationships, particularly with reference to the limitations and essential meaning of the technic.

The thousands of positive reactions covered by this study represent a relatively few specific reactions, three of which have to some extent been characterized. The value within the family or genus is limited by the number of these reactive complements within the group. The technic is apparently of little value in a differentiation of widely separated groups. It introduces the idea of test species containing a known reactive complement, pending the time when more is known concerning the nature of the reactive ingredients.—(*Courtesy Biol. Abs.*)

Units of plant sociology, H. S. CONARD (*Science, 78 (1933), No. 2020, pp. 237, 238*).—The author discusses the long-standing confusion in phytogeographic and phytosociologic nomenclatures and shows how the matter has been largely cleared up by certain European ecologists. He concludes that geographic units and categories are essential and adequate for geographic purposes, but that sociologic units and categories are wholly distinct and should be sufficient unto themselves. The recognition of these units will make possible the long desired description and understanding of plant distribution, and thereby of animal distribution also.

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, October 1 to December 31, 1931, and January 1 to March 31, 1932 (*U.S. Dept. Agr., Inventories Nos. 109 (1933), pp. 35; 110 (1933), pp. 96*).—A total of 1,269 and 2,705 lots of plant material introduced into the United States are listed and discussed in these numbers.

GENETICS

Summary of reports [on plant breeding] received from countries exclusive of the British Empire, 1928–31 (*Imp. Bur. Plant Genet. [Cambridge], Plant Breeding Abs., Sup. 1 (1933), pp. 43+[2]*).—Supplementing an earlier report (E.S.R., 67, p. 512), this review lists genetic and improvement research in progress with field crops, vegetables, fruits, nuts, oil, rubber, fiber, and condimental plants in different countries throughout the world other than the U.S.S.R. and the British Empire.

Chromosome numbers in angiosperms, IV, L. O. GAISER (In *Bibliographia Genetica. 's Gravenhage (The Hague): Martinus Nijhoff, 1933, vol. 10, pp. 105–250*).—The main list (pp. 120–250) consists entirely of reports published in 1930 and an extensive bibliography, while papers published before 1930 and not included in previous lists (E.S.R., 66, p. 25) are assembled in the supplement (pp. 108–119) with a separate bibliography.

Inheritance of chlorophyll deficiencies, H. DE HAAN (In *Bibliographia Genetica. 's Gravenhage (The Hague): Martinus Nijhoff, 1933, vol. 10, pp. 357–416*).—Recent genetic studies involving chlorophyll deficiencies in various plants are reviewed under the groupings of Mendelian inheritance of unicolored and variegated chlorophyll deficiencies, non-Mendelian inheritance of chlorophyll deficiencies, frequency of mutation and lethal genes, and infectious chlorosis. An extensive bibliography and an index are appended.

A contribution to the sterility and irregularities in the meiotic processes caused by virus diseases, D. KOSTOFF (*Genetica ['s Gravenhage], 15 (1933), No. 1–2, pp. 103–114, figs. 15*).—Female sterility in certain species of *Nicotiana* is described in relation to virus or mosaic infection. *N. tabacum* and the tomato, infected by a virus termed female sterility virus, showed abnormal meiosis. The mosaic disease also causes partial sterility of a somewhat different nature. It is inferred that polyploid and heteroploid plants may arise from chromosomal changes caused by mosaic.—(*Courtesy Biol. Abs.*)

The cytology of wheat × rye hybrids of the 5th and 6th generation, H. C. Gurney (*Aust. Jour. Expt. Biol. and Med. Sci., 11 (1933), No. 2, pp. 123–137, figs. 20*).—Cytological studies at Waite Institute for Agricultural Research made on plants from the fifth and sixth generations of Marshall No. 3 wheat × New Zealand rye showed chromosome numbers ranging from 15 to 21 in tall plants and from 13 to 18 in dwarfs. Other peculiarities were noted. The hybrids could be grouped as intermediate, very variable, more stable wheat-like, and a rye-like and also very spelt type. The rye-like type showed a predominance of typical rye bivalents, while in the wheat-like type the recognizable wheat bivalents predominated, and chromosome numbers ranged from 20 to 22. It is suggested that dwarfing may be caused by chromosome deficiency, as well as by Mendelian factors.

The development of rust-resistant beans by hybridization, S. A. Wingard (*Virginia Sta. Tech. Bul. 51 (1933), pp. 40, figs. 18*).—Crosses, direct and reciprocal, were made between various combinations of varieties resistant to rust (*Uromyces appendiculatus*) and rust-susceptible field and garden beans. Observations on the purely physical characters of the resulting progeny showed evidence of heterosis in many instances. For example, in Marblehead × Powell Prolific the F_1 plants averaged 227.9 percent more pods per plant than the Marblehead and 721.3 percent more than the Powell Prolific parent.

With respect to the inheritance of rust resistance, the F_1 plants of all crosses between rust-resistant and rust-susceptible varieties and their reciprocals were rust resistant, indicating that resistance is dominant over susceptibility. Segregation in the F_2 in the proportion of three resistant plants to one susceptible indicated that a single factor determines resistance to rust. A suggestion of linkage of rust resistance with other characters in the rust-resistant ancestors was suspected because of the number of generations required to produce varieties combining these desirable characters with rust resistance. It is concluded that rust resistance in beans is due to the hypersensitiveness of the host to the rust fungus. Apparently the host tissues die and surround the rust hyphae with a medium in which they cannot survive. Being an obligate parasite, survival was possible only in living tissues.

The cytoplasmic inheritance of male sterility in Zea mays, M. M. Rhoades (*Jour. Genet., 27 (1933), No. 1, pp. 71–93, figs. 3*).—A more detailed study of the case already noted (E.S.R., 65, p. 625), with similar conclusions.

Inheritance of flowering duration in rice (Oryza sativa L.), K. Ramiah (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 377–410, pl. 1, figs. 11*).—In rice the flowering period was observed to vary according to variety from 60 to 180 days. The studies showed that the inheritance may in some cases show a single factor difference between earliness and lateness and be rather complex in others, explainable only under the multiple-factor hypothesis. Several genetic factors seemed to be concerned in the inheritance of flowering duration, and varieties may carry either a few or several of these factors. Where many factors are involved F_1 appears to be intermediate between the parents, and in F_2 a transgressive variation or a variation within the parental limits is obtained, while the parental types are hardly recovered. Varieties with the same flowering duration may differ in factorial composition as to this character, giving a transgressive variation in the F_2's of their crosses. Certain pure types derived from such crosses were both earlier and later than the parents. Earliness generally was found dominant to lateness, although in one case earliness was recessive.

Inheritance of height of plants in rice (Oryza sativa L.), K. Ramiah (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 411–432, pls. 3, figs. 7*).—Examination of the data of the Paddy Breeding Station, Coimbatore, showed that inheritance of plant height in rice may be simple or complex, depending upon varietal constitution. Varieties exhibiting the same mean height may still differ in their composition of genetic factors controlling height. Shortness may be a simple dominant to tallness, or tallness may be a simple dominant to shortness. The behavior of the F_1's and F_2's even in complex cases strictly conform to a Mendelian interpretation on a multiple-factor hypothesis.

Genetic association between flowering duration and plant height and their relationship to other characters in rice (Oryza sativa L.), K. Ramiah (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 433–445, fig. 1*).—A definite and strong association was established between height and flowering duration, their correlation being generally positive. The behavior of the parents in crosses described suggested that the correlation is positive in early and negative in late varieties, a behavior apparently consistent with a physiological explanation. The correlation between the two characters was suspected to be necessarily genetic because of the absence of correlation and segregation for the characters in progenies of certain crosses whose parents differed greatly from each other for the characters.

The two characters were also associated with other quantitative characters as length of panicle and emergence of panicle, and with final yield, the later and taller plants giving a considerably increased yield over earlier and shorter plants. They were also associated with qualitative characters as color of glume and of rice. Association was also noted between flowering duration and the lodging or erect nature of the culm.

Inhibitory factor hypothesis and the inheritance of flowering duration and plant height in rice (Oryza sativa L.), K. Ramiah (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 446–459, figs. 2*).—Study of 6 crosses, variously involving four pure types termed short early dominant, short early recessive, tall late dominant, and tall late recessive, respectively, into the F_2 and F_3 generations confirmed the existence of a strong association of plant height and flowering duration. The entire dominance of characters of either of the parents in the F_1's indicated the simplicity of the segregation. The genetic constitutions of the four parents, from the results of the crosses from whose progeny they were extracted, agreed with the F_2 and F_3 behaviors. The clear-cut segregation or the overlap of the two groups, short early and tall late, in the F_2's was attributed to the genetic factorial differences of the parents and to their peculiar behavior as to the association of duration and height.

Inheritance of characters in sorghum—the great millet (*Indian Jour. Agr. Sci., 3 (1933), No. 4, pp. 589–604, pls. 2*).—Additional contributions are made to the series (E.S.R., 68, p. 750).

II. *Purple pigmentation on leaf-sheath and glume*, G. N. R. Ayyangar, C. Vijiaraghavan, V. G. Pillai, and M. A. S. Ayyar.—In sorghum the color of the leaf sheath and the color on the glume are associated. The purple-pigmented are separated from the brown-sheathed varieties by a factor *P*. In the *P* group, a factor *Q* helps to separate further the purple into reddish and blackish purple, the latter being recessive.

III. *Grain colours: Red, yellow, and white*, G. N. R. Ayyangar, C. Vijiaraghavan, M. A. S. Ayyar, and V. P. Rao.—Study of the interrelationships between red, yellow, and white kernel colors in sorghum showed yellow (*Y*) to be the basic color. With *R*, red kernels are produced; *W* determines the ability to manifest whole color; in the absence of *W*, *R* gives a white kernel with a red base, and similarly *Y* gives a white kernel with a yellow base. Dry anther colors parallel kernel colors and aid in the separation of the white kernels into their respective allelomorphs to colored kernels. The factor *I* determines intensity of color manifestation and is noticeable in the red group. Red without *I* gives a pink kernel.

A preliminary note on the occurrence of sepaloidy and sterility in til (Sesamum indicum), S. C. Roy (*Agr. and Livestock in India, 1 (1931), No. 3, pp. 282–285*).—Sepaloidy in *S. indicum* was observed to be a malformation intimately connected with sterility. Absence of good pollen, nondehiscence of anthers, and complete absence of ovules make it impossible for the sepaloid flowers to form seed.

Characters of peach, M. A. Blake (*N.J. Agr., 15 (1933), No. 3, p. 4*).—Among additional types of inheritance discovered in breeding studies at the New Jersey Experiment Stations were the dominance of red flesh color about the pit over the absence of red, the recessiveness of nonmelting flesh to both watery-melting and firm-melting flesh, the dominance of heavy pubescence over light pubescence, the dominance of oval fruit shape over round, and the apparent dominance of early blooming over late blooming.

[Studies in animal genetics of the Bureau of Animal Industry] (*U.S. Dept. Agr., Bur. Anim. Indus. Rpt., 1933, pp. 3, 4*).—Brief reports are given on the results of studies of the relationship of age at first breeding to fertility in guinea pigs; relation of inbreeding to the cellular characteristics of the endocrine glands, particularly the pituitary, in guinea pigs; and successive generations of inbreeding Chester White and Tamworth hogs.

[Color inheritance in foxes] (*U.S. Dept. Agr., Bur. Biol. Survey Rpt., 1933, p. 11*).—The inheritance of the three principal color types in foxes—red, cross, and black—and differences between plain black and Alaskan black (silver) are briefly discussed.

Hound-eared mice, B. W. McPheters and C. C. Little (*Jour. Heredity, 24 (1933), No. 4, pp. 157, 158, fig. 1*).—The occurrence of a character designated as "hound-ear", similar to the ear defect in swine previously noted by Nordby (E.S.R., 66, p. 817), is described.

The F_1s from a mating of hound-eared stock with two normal-eared stocks were all normal, but in the F_2 generation there were produced 15.8 percent hound-eared offspring in one group of 76 individuals and 7.7 percent among 65 in another.

Hound-eared animals bred inter se produced 36 normals to 25 hound-eared offspring, suggesting the operation of modifying factors in addition to a major recessive gene.

Variation and heredity of some characters in White Leghorns, Rhode Island Reds and Barnevelders, J. Axelsson (*Lunds Univ. Årsskr., n. ser., Sect. 2, 28 (1932), No. 4, pp. 196, figs. 4*).—The results of a study are reported dealing with the mode of inheritance of the contrasting characters observed in the White Leghorn, Rhode Island Red, and Barnevelder breeds. In three years study was made of 27 different types of matings of the pure breeds, crosses between them, and back crosses. The contrasting characters studied included those relating to hatchability of the eggs and egg characteristics; rate of feathering; growth; color of plumage, beak, and legs; and other incidental characteristics.

Inheritance of rate of growth in domestic fowl.—II, Genetic variation in growth of Leghorns, V. S. Asmundson and I. M. Lerner (*Poultry Sci., 12

(1933), No. 4, pp. 250–255, fig. 1).—Continuing this series (E.S.R., 69, p. 848), the rate of growth from 2 to 8 weeks of age for 340 Single Comb White Leghorn chicks was calculated by a modified formula of Minot, employed by Brody (E.S.R., 58, p 352). From the growth curves calculated, males were shown to grow more rapidly than females. Time of hatching of the chicks also influenced growth rates significantly, the differences between those produced in the first and second hatch and those produced in the third and fourth hatch being more than three times their probable errors.

The 340 birds employed in the study were the progeny of 6 different males, and there were more than 15 birds available from 3 of the males. Of the 6 families from which sufficient offspring were produced to study the inheritance of growth rate, there were 3 families with a comparatively rapid rate of growth and 1 with a relatively slow rate of growth. The differences between these groups were statistically significant and suggested that rate of growth within these strains was controlled by multiple genetic factors.

A gene modifying frizzling in the fowl, W. Landauer (*Jour. Heredity, 24 (1933), No. 4, pp. 152–156, figs. 2*).—Continuing the studies of the inheritance of frizzling in the domestic fowl at the [Connecticut] Storrs Station (E.S.R., 65, p. 523), the occurrence of a recessive modifying factor is noted. This factor appeared to act as an inhibitor of frizzling which was apparently rather generally distributed in normal stocks. A ratio of 1:2:1 of normals, low-grade Frizzles, and modified homozygous Frizzles was observed in 93 chicks from inter se matings of modified heterozygous Frizzles. A similar ratio was obtained in matings of typical heterozygous Frizzle females with homozygous Frizzle males.

Inheritance of white spotting in ducks, R. G. Jaap (*Poultry Sci., 12 (1933), No. 4, pp. 233–241, figs. 3*).—Studies at the Wisconsin Experiment Station of the plumage pattern in ducks showed that there are genetically two factors which cause white primaries. One is recessive, designated as *w*, while the other is the expression of the heterozygote for the runner pattern *R*.

Of 26 matings of Mallards (colored primaries), 9 matings produced 2 or more ducklings with white primaries. Among these young there were 200 with colored primaries and 63 with white, which closely approached the expected 3:1 ratio in the behavior of recessive *w*.

Studies of the inheritance of the runner gene from a White Pekin and Mallards with white primaries were conducted in several types of matings, including back-crosses, and the results seemed to fit the hypothesis advanced. Further confirmatory data were derived from matings involving the interaction of *R* and *w* in which more than 300 ducklings were produced.

In further study of the mode of inheritance of a characteristic designated as white bib, which was described as a large white shield-shaped area occupying most of the claret breast region of Mallards, in an F_2 generation of 86 individuals 65 were without and 21 had the bib. This approximated closely the 3:1 ratio. The back-cross matings produced approximately equal numbers. These results suggest the action of an autosomal recessive gene, designated as *b*, responsible for the presence of the white bib in the Mallard duck.

The white feathers of the true bib showed no pigment. One male, showing the white region but having the basal part of the feathers a light slate color, was tested genetically and found to differ from birds exhibiting the true bib character.

Physiological research at the Beltsville laboratory (*U.S. Dept. Agr., Bur. Dairy Indus. Rpt., 1933, pp. 10, 11*).—The results are briefly reported of studies of the transportation en masse of spermatozoa in the uterine tract of the dog and the individual movement of spermatozoa in the uterine tract of the cow up to the mouth of the oviduct. Efforts were also made to preserve bulls' spermatozoa for artificial insemination.

The investigation also included a study of the influence of the anterior lobe of the pituitary gland on milk secretion in the cow, goat, dog, and rabbit.

Artificial induction of ovulation and oestrum in the ewe during anoestrum, H. H. Cole and R. F. Miller (*Amer. Jour. Physiol., 104 (1933), No. 1, pp. 165–171*).—In studies at the California Experiment Station it was found that ovulation without oestrum could be induced in ewes during the anoestrous period by one or more injections of pregnant mare serum containing 50 or more rat units of the gonad-stimulating hormone. With a second injection 16 or 17 days later normal oestrum was exhibited. Where mating was permitted many of them were fertile. Sixty-one ewes were employed in the studies.

Ovarian responses to prolan and anterior pituitary extract in hypophysectomized rabbits with particular reference to ovulation, W. E. White and S. L. Leonard (*Amer. Jour. Physiol., 104 (1933), No. 1, pp. 44–50, figs. 3*).—Studies with 35 rabbits indicated that approximately from one sixth to one third more of the extract of the anterior pituitary lobe of the hypophysis and one half more of the dose of prolan were required to induce ovulation in rabbits hypophysectomized in heat than in normal females in heat. The corpora lutea in these animals, although smaller than normal, were able to produce sufficient hormone to form a progestational endometrium in the uterus. Differences between the physiological response to prolan and the gonadotropic hormones of the pituitary were noted.

The survival of the spermatozoon in the domesticated fowl, A. Walton and E. O. Whetham (*Jour. Expt. Biol., 10 (1933), No. 3, pp. 204–211*).—An attempt was made to determine how spermatozoa in the fowl survive for such long intervals after mating. Fertilized eggs were laid approximately as long after mating as eggs which showed the presence of Sudan III in the yolks after the feeding of this substance. Washing the oviduct with spermicides did not shorten the time over which fertile eggs were laid.

These findings suggest the fertilization of the ova while they are on the ovary, but do not prove it because of the possibility of spermatozoa resting in the folds of the oviduct.

FIELD CROPS

[Agronomic research in the Bureau of Plant Industry] (*U.S. Dept. Agr., Bur. Plant Indus. Rpt., 1933, pp. 8, 9, 10, 11, 12, 13–16, 17–19, 22, 23, 24*).—Brief reviews are given of the progress of and accomplishments in breeding work with corn, popcorn, wheat, oats, barley, grain sorghum, rice, cotton, potatoes, sweetpotatoes, sugar beets, sugarcane, peanuts, alfalfa, and sweetclover; cytological studies with corn-teosinte hybrids; cultural and tillage experiments with crops under dry land conditions; planting tests with sweetclover; seed studies with grasses, vetch, and lespedeza; harvesting studies with potatoes and timothy; storage tests with potatoes, sugarcane, and farm seeds; response of seed flax varieties to environment; the nitrogen-nutrition and sulfur-fertilization of tobacco; fertilizer, blocking, spraying, and irrigation experiments with sugar beets; winter legumes for soil erosion control and green manure; crotalaria as a soil improver; fertilizer, management, and reestablishment of pastures; community production of cotton; fertilizer and preparation experiments with fiber flax; and the grading of abaca. Many of the investigations were in cooperation with State experiment stations.

Values and limitations of clipped quadrats, M. J. Culley, R. S. Campbell, and R. H. Canfield (*Ecology, 14 (1933), No. 1, pp. 35–39*).—Appraisal of the value of clipped quadrats shows that clipping treatment may be applied to the field almost directly in work with field crops and turf. While it fails to simulate grazing by livestock exactly, clipped quadrats when carefully selected and conducted can be of considerable value to actual grazing studies. Results can be obtained economically to show the comparative maintenance, yield, and quality of forage species under known varying intensities of harvesting with the effects of given amounts and character of rainfall upon production. The method already has aided in determining correct utilization of range and pasture forage, a feature vital for conservation of forage and watershed resources.

Kinds of crop plants under cultivation in the world, M. Akemine (*Agr. and Hort. [Tokyo], 8 (1933), No. 8–10, pp. 19–75; Eng. abs., p. 73*).—The English, Japanese, and scientific names are listed for 1,279 crop plants grown in the world, which are grouped into 17 divisions according to their uses. See also an earlier note (E.S.R., 65, p. 628).

Texas grasses, W. A. Silveus (*San Antonio: Author, 1933, pp. XLVI+782, [figs. 418]*).—This book includes descriptions, illustrations, and the known distribution in Texas and elsewhere in North America of genera and species of grasses. The subfamilies and tribes are described with appropriate determinative keys to the tribes and genera. The volume also includes a glossary and index and features the pronunciation of botanical terms and scientific names of grasses. The scope of the subject is indicated by the author's statement, "Texas has about 550 species of grasses, representing 13 of the 14 tribes, and nearly all the genera of the United States. There are from 1,100 to 1,200 species in the United States, being about one fifth of the total number known. It is estimated that Texas has at least three fourths of the species to be found in any State east of the Rocky Mountains."

Technique employed in grassland research in New Zealand (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 11 (1933), pp. 49, pls. [11], fig. 1*).—The technic used in forage crop research in New Zealand is described in articles entitled Strain Testing and Strain Building, by E. B. Levy (pp. 6–16); The Certification of Herbage Seeds in New Zealand, by J. W. Hadfield (pp. 17–20); Measurement of Pasture Production—Extension and Demonstration Field Trials, by A. W. Hudson (pp. 21–35); Methods Employed in the Breeding of Pasture Plants, by J. W. Calder (pp. 36–39); Strain Trials with Crested Dogstail (*Cynosurus cristatus*), by W. A. Jacques (pp. 40, 41); Lucerne Strain Trials, by J. W. Hadfield (p. 42); Quantitative HCN Determinations of White Clover Types, by B. W. Doak (p. 43); and The Use of Screened Ultra-Violet Light in Ryegrass Type Determination, by N. R. Foy (pp. 44–49).

Effect of frequent clipping on the development of roots and tops of grasses in prairie sod, H. H. Biswell and J. E. Weaver (*Ecology, 14 (1933), No. 4, pp. 368–390, figs. 8*).—The effects of the removal of tops of grasses on root growth in soil and on regeneration and yield of aerial parts were studied at the University of Nebraska. Blocks of well-established sod on several native pasture grasses were transplanted into large containers, grown in the field, and clipped every two weeks.

Tops cut upon transplanting resumed growth immediately, as well as after each subsequent cutting from July to October. The dry weight of tops of *Andropogon furcatus*, *A. scoparius*, *Panicum virgatum*, *Bouteloua gracilis*, and *Bulbilis dactyloides* increased for the first three to five intervals following the initial clipping, but decreased rapidly thereafter. The yield of *Poa pratensis* rose after each clipping. *Panicum virgatum* and *Bouteloua curtipendula*, trans planted in midsummer, decreased in yield after the first clipping. Unclipped grasses grew normally and usually produced flower stalks and seeds.

The total dry weight of tops from clipped sods ranged from 13.1 to 47.5 percent of that of the same species unclipped after transplanting. In all cases the ground cover decreased considerably as the stand of the weakened grasses became thinner. Clipped plants failed to produce new rhizomes, and many old plants died. The roots decreased greatly in length, and the relative production of roots was reduced to a greater extent than that of tops. By volume it ranged from 3.5 percent of the controls to 18.6 percent, while the dry weight varied from 2.6 to 20.6 percent. The average volume of roots of the clipped sods was 11.7 percent and the average dry weight 10.1 percent of that of controls. Roots of clipped grasses were smaller in diameter than those of controls. Plants weakened by repeated clipping renewed growth slowly if at all after being frozen.

The influence of frequency of cutting on the productivity, botanical and chemical composition, and the nutritive value of "natural" pastures in southern Australia, J. G. Davies and A. H. Sim *(Aust. Council Sci. and Indus. Res. Pam. 18 (1931), pp. 28, figs. 6)*.—Natural pasture at Waite Institute produced the highest yield of dry matter when the herbage was allowed to mature. Cutting more often, especially fortnightly, tended to reduce the yield. Pasture cut three times during the season yielded about 94 percent as much as from one cut, producing herbage of higher nutritive value and lower fiber content than mature herbage. Severe defoliation reduced the yield of erect species, while certain rosette species gave a higher acre yield when the pasture was cut fortnightly. Rainfall and temperature are indicated as important factors governing production, and the effects of cutting frequencies on the calcium, phosphorus, crude protein, and fiber content of the herbage are discussed.

The development and survival of species and varieties in planted pastures, H. F. Eisele and J. M. Aikman *(Ecology, 14 (1933), No. 2, pp. 123–135, figs. 4)*.—The reaction of different species and varieties of grasses and legumes in pure seedings and in mixtures was studied on field plats at the Iowa Experiment Station.

Remarkable constancy in the total number of grass and legume plants in all mixtures was revealed by list-count quadrats. Very slight variation in number of plants per quadrat resulted from planting different numbers of seed within limits of 2,300 and 7,700 seeds per meter quadrat, suggesting that there is an optimum number of plants of similar requirements that a given area can support. In early spring, legumes appeared to be hardier when planted with grasses than when planted separately. That mixtures containing two or three different kinds of pasture plants show much less overlapping of individual plants than those including more than three different types was indicated by chart quadrats obtained when the plants were relatively small. Chart quadrats at maturity showed the relative importance of tall, infrequent species. Severe drought seemed to weaken most grasses and to kill out the clovers because they could not re-seed under such conditions. Bluegrass entered in increased quantities during wet periods after severe drought.

Similar mixtures of grasses and legumes produced about the same dry weight per quadrat, outyielding mixtures of grasses. Quadrats from single-species plats did not yield as much as any mixture. The effect of frequent clipping was less evident in single-species plats and in a mixture omitting legumes than in mixtures of grasses and legumes. Competition seemed so keen between individual plants of a single species planted alone that frequent clipping did not appear to decrease materially the yield compared with check plats, this being more evident in plats of single species of grasses and in mixtures of grasses than in plats of single species of legumes.

The effect of some commercial fertilizers on the botanical composition and yield of permanent pastures, F. S. NOWOSAD (*Sci. Agr., 14 (1933), No. 2, pp. 57–69, pl. [1]*).—Permanent pastures on typical brown forest soil near Cowansville, Quebec, were used to measure the influence of nitrogen, phosphorus, and potassium alone or in combination, and with and without lime, in 1931–32. Liming resulted in a definite increase in yield in one series and a significant loss in another. Phosphorus, potassium, and nitrogen increased the yield, especially where they were applied in combination. In the first year, significant increases were obtained on plats receiving lime, nitrogen, phosphorus, and potassium; nitrogen, phosphorus, and potassium; lime, phosphorus, and potassium; phosphorus and potassium; and lime and phosphorus. In the second year, only the complete treatment, lime, nitrogen, phosphorus, and potassium, resulted in a significant increase. Differences between the several plats were smaller in the second than in the first year.

The influence of the treatments on botanical composition was not very definite, although in the first series lime increased the percentage of useful herbage and diminished the weeds, moss, and bare ground. Phosphorus increased clover in both years, whereas the other elements did not give significant results. In the second series, lime increased the percentage of grasses and reduced the percentage of clover, whereas superphosphate and potassium increased the proportion of clover. Nitrogen, however, reduced the proportion of clover and increased the weeds.

Grazing (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 10 (1933), pp. 22*).—This publication contains articles entitled Grazing in the Midlands, by P. F. Astill (pp. 5–7); The Biotic Factor—Lessons from Australian and New Zealand Grasslands, by W. Davies (pp. 8–12); The Art of Grazing and Its Effect on the Sward, by M. G. Jones (pp. 13–16); and Some Economic Aspects of Grassland, by A. Bridges (pp. 17–22).

Lucerne: Its ecological position and distribution in the world, M. KLINKOWSKI (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 12 (1933), pp. 62+III, figs. 18*).—The origin and migration of alfalfa and its distribution in different countries throughout the world are described with mention of geographic distribution of cultivated types and of plant shape in Europe, Asia, and North Africa. An index of varieties and strains and a bibliography of 226 titles are appended.

Studies on the malting quality of barley, T. J. HARRISON (*Sci. Agr., 14 (1933), No. 3, pp. 131–135*).—Tests (E.S.R., 61, p. 220) on a number of barleys from different parts of Canada indicated that Prince Edward Island should produce the best barley in the Dominion, and that a fair quality could be produced in the other eastern Provinces. The quality varies in British Columbia, depending on the soil and climatic conditions of the different valleys. On the prairies, Manitoba, especially the eastern and northern parts, produces the best quality, although fair quality can be grown in the northern sections of Saskatchewan and Alberta.

In a comparison of varieties for the Canadian method of malting, the Manchurian group of 6-row barleys, particularly O.A.C. No. 21 and Chinese, gave best results. July, an introduction from Ireland, was the best malting barley in the group, but did not give good agronomic results. The Mediterranean group was unsatisfactory. The Chevalier group of 2-row barleys, especially Hannchen and Plumage Archer, distinctly surpassed the Duckbill group. The same varieties of 6-row and 2-row barley also gave the best results with the floor method of malting used in England.

The control of Bermuda grass through the use of chlorates, H. F. Murphy (*Jour. Amer. Soc. Agron., 25 (1933), No. 10, pp. 700–704*).—Very good control was secured in Oklahoma Experiment Station experiments on both mowed and unmowed Bermuda grass by either sodium chlorate or calcium chlorate when used in two applications each at the rate of 200 lb. per acre one and one half months apart, from July 15 to September 3. However, the rate and cost of either chemical is such that they could only be recommended for small areas or for control along garden and shrubbery borders. Sowing cane on weakened Bermuda grass sod proved to be a good control method where larger areas were involved.

Berseem inoculation experiments in the Punjab, R. S. Sarkaria (*Agr. and Livestock in India, 3 (1933), No. 1, pp. 16–32, fig. 1*).—Most Punjab soils were found to lack the nodule bacteria of berseem clover (*Trifolium alexandrinum*) and to require inoculation when the crop was grown for the first time. Inoculation increased yield and quality, especially on soils not growing berseem before, and produced greater profit at less cost than did several fertilizer treatments.

Observations on the castor-oil plant (Ricinus communis Linn.) in the United Provinces, R. L. Sethi (*Agr. and Livestock in India, 1 (1931), No. 3, pp. 243–262, pls. 5*).—Cultural practices used in growing castor-beans in the United Provinces are outlined, and results of experiments concerned with the effect of variety, soil fertility, and plant characters on oil content are summarized.

Certain varieties found in these provinces were superior to outside varieties and contain a fairly high percentage (54 to 56) of oil. Cow dung seemed the best of several fertilizers for increasing yield and vegetative growth, while margosa (*Azadirachta indica*) cake appeared best for increasing the oil percentage. Varieties with small seed showed greater percentages of oil in their seed than those with large seed. Seed of the central branch of a plant always contained more oil than that of a side branch. The central branch bears the largest number of fruits and generally matures earlier than the side branches. The oil content of castor seed seemed to depend more upon the degree of maturity than on any other factor. Differences in oil percentage were not found between seed from dehiscent and nondehiscent fruits, green- and red-stemmed plants, or from spiny- and smooth-walled capsules, high and low percentages being found in both conditions of each phase. The ideal plant evidently should have big, densely crowded, fruiting racemes, high yield, and nondehiscent thin-walled capsules of uniform maturity, containing small-sized seed with the highest possible oil content.

Castor-breeding in the Bombay Presidency, N. G. Masur (*Agr. and Livestock in India, 3 (1933), No. 2, pp. 125–143, fig. 1*).—The progress of breeding work with the castor-bean is reviewed with observations on the inheritance of morphological characters, maturity, and oil content, and discussion of factors affecting yield, including number of inflorescences per plant and of fruit per inflorescence, size of seed, and environment.

Coir: Report on the attributes and preparation of coconut fibre, S. G. Barker (*London: Empire Marketing Bd., 1933, pp. 67, pl. 1*).—The commercial status of coir, the fiber extracted from coconut husks, the characteristics of the palm, the processes of harvesting the nuts, removing the husks, retting and extraction of fiber, and the physical, chemical, and technological properties of the fiber and its utilization are described in some detail, with a bibliography embracing 57 titles.

World's diversity of phenotypes of maize, N. N. Kuleshov (*Jour. Amer. Soc. Agron., 25 (1933), No. 10, pp. 688–700, fig. 1*).—Observations on extensive material grown by the U.S.S.R. Institute of Plant Industry considered the relation between length of growing season and number of leaves in different varieties of corn, biology of flowering, characteristics of vegetative types of corn, and the diversity within and the geographic distribution of the systematic corn groups.

The effect of picking date of parent seed on some economic characters of the cotton plant, C. J. RAO (*Madras Agr. Jour., 21 (1933), No. 1, pp. 28–32, pl. 1*).—Observations during two seasons on boll characters of parent plants and progeny of a pure line of *Gossypium indicum* picked at brief intervals over 47 days showed that seed cotton, seed weight, and lint weight decreased distinctly in value as the season advanced, while lint length and ginning percentage fell off only slightly. With ovules and seeds per lock the decline was preceded by a rise. The high or low parental value occurring as a seasonal variation seemed to have no influence on the progeny average, and except as modified by the seasonal and environmental influences surrounding the progeny, the average of the offspring tended to regress to the mean value of the parent.

The effect of soaking in water on the " seeds " of Dactylis glomerata L., H. G. CHIPPINDALE (*Ann. Bot. [London], 47 (1933), No. 188, pp. 841–849*).—Orchard grass seed was found to germinate better at a varied than at a constant temperature, especially if ripened under unfavorable conditions. With either temperature condition, germination was much faster if the seeds were previously soaked in water and dried, an effect due to the more rapid water absorption by the treated seeds.

Studies in Setaria italica (Beauv.), the Italian millet.—Part I, Anthesis and pollination, G. N. R. AYYANGAR, T. R. NARAYANAN, and P. S. SARMA (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 561–571, pl. 1, fig. 1*).—Observations on anthesis in *S. italica* during several seasons at Coimbatore revealed that a spike may take from 10 to 15 days to complete flowering, depending upon its size. The flowers open from 8 p.m. to 10 a.m., although in summer stray flowers may open between 10 a.m. and 8 p.m. Flowering ceases in the hot part of the day, but with the increase in humidity and the fall in temperature it begins and becomes intense toward midnight, after which there is a slow fall and a second flush soon after sunrise. The floral arrangement favors self-pollination. Bristle variations, spikelet-tipped bristles, and anther and grain color differences do not affect the general tenor of anthesis.

Oat varieties highly resistant to crown rust and their probable agronomic value, T. R. STANTON and H. C. MURPHY (*Jour. Amer. Soc. Agron., 25 (1933), No. 10, pp. 674–683*).—Agronomic and pathologic observations made by the U.S.D.A. Bureau of Plant Industry cooperating with the Iowa Experiment Station, on Bond, Alber, and other oats varieties highly resistant to crown rust are reported, with further results on Victoria (E.S.R., 63, p. 827) and some closely allied strains. Bond, a new hybrid from Australia, combined resistance to crown rust with desirable agronomic characters, and Kareela, originating in Australia as a selection from Fulghum, showed partial resistance to crown rust. The two Victoria strains (C.I. Nos. 2401 and 2764) showed high resistance to 32 physiologic forms of crown rust collected in North America from 1927 to 1931. Other new varieties deemed worthy of consideration with respect to resistance to crown rust include Pampa, Alber, strains of Capa, Criolla, Red Algerian, and Berger. The chief value of these new crown-rust-resistant strains, including Bond and Kareela, probably will be for the development of more desirable agronomic varieties by hybridization.

Studies on germination and growth in groundnut (Arachis hypogaea Linn), A. MOHAMMAD, Z. ALAM, and K. L. KHANNA (*Agr. and Livestock in India, 3 (1933), No. 2, pp. 91–115, pl. 1, figs. 8*).—Early maturity in peanuts seemed to be associated with the bunch habit and lateness with the runner habit. Runner varieties exhibited greater disease resistance. Field germination tests showed that seeds germinated better than pods, although germination of either seeds or pods was facilitated by soaking in water before planting. Seeds with injured cotyledons or seed coats did not appear fit for planting. Varietal differences in root and shoot development and functions of hairs on roots, gynophores, and pods are described.

Formation of leaves and flowers in the peanut was shown to proceed simultaneously. Maximum vegetative growth and flower production, a critical period of growth, lasted from 56 to 97 days and from 70 to 125 days after planting bunch and runner varieties, respectively. Root and shoot development corresponded closely in the several varieties studied. Plants grown in sand or clay showed a very poor development, although the addition of limestone to clay proved beneficial. Liming the soil encouraged both root and shoot development in the early growth stages at least, induced early flowering, and promoted the development of nodules on roots, while ammonium sulfate retarded plant growth, delayed flowering, and inhibited nodule production.

The classification of groundnut varieties, T. R. Hayes (*Trop. Agr.* [*Trinidad*], *10* (*1933*), *No. 11, pp. 318–327, figs. 4*).—Thirty-five varieties of peanuts are classified on the basis of flower, vegetative, and seed characters into four bunch and six runner groups.

Analysis of the F_2 generation of a Valencia × Sine cross showed as dominant and recessive, respectively, red-brown v. light brown testa, much v. slight color on the stem, runner v. bunch habit, long v. short seed, flowers fading early v. late, deep- v. light-colored corolla, presence v. absence of red on leaflet vein, Sine v. Valencia leaf shape, fertile v. sterile plants, normal v. crinkled leaf, and presence v. absence of rachis. No characters giving clean-cut segregation showed any relation with each other. Eight characters, five vegetative, were found to be related to yield. Search for a type immune to rosette disease was inconclusive.

Fertilizer placement studies on Sassafras loam with the potato in New Jersey, W. H. Martin, B. E. Brown, and G. A. Cumings (*Amer. Potato Jour.*, *10* (*1933*), *No. 10, pp. 191–199*).—Fertilizer placement studies with Irish Cobbler potatoes were made in 1931–32 by the New Jersey Experiment Stations cooperating with the U.S. Department of Agriculture.

Germination was retarded seriously where fertilizer was applied in the row or under the set, and retarded slightly where fertilizer was applied over the set. The earliest germination, most uniform growth, and largest vines followed fertilizer application in two bands, one on each side of the set. The plant food concentration of the fertilizer had slight influence on germination, subsequent plant growth, or on either tuber number or size. The most tubers were produced where the fertilizer was located at the side of the set and the fewest tubers where it was applied in the row. In general, locations producing the fewest tubers produced the largest tubers. Largest total yields resulted from side application of the fertilizer, regardless of whether on or below set level. Indications were that for largest returns fertilizer should be applied in a band 2 in. to each side of and on the same plane as the set, or 2 in. to each side of and 2 in. below the set.

The relative vigor and productivity of potato plants from basal and apical sets, F. C. Stewart (*New York State Sta. Bul. 633* (*1933*), *pp. 18, fig. 1*).—Comparisons of a 42-g basal set with one 28-g and two 14-g apical sets from the same seed tuber of Rural potatoes were made first in 1928 with seed affected with leaf roll and again in 1932 with healthy stock. The latter experiment also included a check in which basal and apical sets of equal weight were compared. In both studies the four sets of each of 79 seed tubers were planted consecutively, forming a 4-set tuber-unit, while the check contained forty-one 2-set tuber-units planted in a single row.

While yields were not taken in the 1928 test, the more rapid early growth of plants from 28-g apical sets indicated their superiority to those from the heavier basal sets, and this was also noted in the 1932 experiment. The average yield of the 28-g apical sets somewhat exceeded that of the latter, although the basal sets produced more stalks. In both years plants from the two 14-g apical sets were about equal, and inferior to plants from the other two kinds of sets. In the check, plants from apical sets outgrew and greatly outyielded plants from basal sets, even though plants from basal sets had more stalks. The results supported the view that plants from apical sets are more vigorous and productive than those from basal sets of equal weight, and also seemed to show that infection of the seed tubers with leaf roll does not alter this relationship.

The effect on vigor and yield of storing cut potato sets, K. C. Westover (*Amer. Potato Jour., 10 (1933), No. 11, pp. 209–223, figs. 2*).—The possibility of holding in cold storage potato sets immediately after cutting was studied at the West Virginia Experiment Station during storage and growing seasons from 1921 to 1929, using White and Russet Rural seed.

Storage losses due to shrinkage were greatest and similar in lots cut during the first eight weeks of storage, whereas shrinkage in lots cut later gradually decreased according to duration of storage. During the comparable period, uncut lots also showed the greatest losses in weight, which usually were less than one fifth of the corresponding cut seed lot. Losses due to shrinkage varied from 12.2 to 27.7 percent in cut lots stored during the entire storage period, and from 3.3 to 12 percent in uncut seed lots. Callousing of the sets apparently was completed in about four days under the storage conditions. Corked areas of seed lots cut during the last half of storage were less intensely discolored as the storage period shortened. Field studies indicated that under existing conditions Rural potato seedstock cut during storage and subjected immediately to general storage conditions might be expected to give poorer stands of weaker plants and lower yields than would freshly cut sets.

The effect of handling methods on quality of Maine potatoes, W. E. Schrumpf (*Maine Sta. Bul. 365 (1933), pp. 181–221, figs. 18*).—In studies made in Aroostook County during the 1931–32 harvest seasons, Green Mountain potatoes were examined for mechanical injuries in the field during digging and in storage houses shortly after storage and during grading.

A total of 47.81 percent of the potatoes handled were affected by handling or mechanical injuries caused by harvesting and storing operations. Major injuries sufficient to reduce tubers from U.S. No. 1 grade to culls amounted to 7.1 percent and minor injuries to 40.71 percent. The amounts of injuries due to the various operations in the ascending order of importance were for cuts, 0.93 percent all from digging; and for bruises, 2.22 percent from picking into baskets, 8.16 from emptying into barrels, 17.38 from digging, and 19.12 from placing in storage. Many minor injuries developed in storage into major injuries, the actual increase of major injuries being 2.55 percent. Bruising caused by moving to graders amounted to 13.27 percent, passing over graders 20.23, and by dropping into containers 10.06, totaling 43.56 percent. The relation of injury to type of digging machines and other factors, and different handling, storage, and grading practices is analyzed in some detail, with inferences on reduction of injury by padding and other adjustments.

A preliminary report on the form of the root system in rice plants [trans. title], T. SASAKI (*Crop Sci. Soc. Japan Proc., 4 (1932), No. 3, pp. 200–225, figs. 5; Eng. abs., pp. 222–225*).—The characteristics of the root system of Shinriki rice grown in both irrigated and dry culture are described and illustrated.

Blooming and anthesis in Kolamba rice, B. S. KADAM and G. G. PATIL (*Indian Jour. Agr. Sci., 3 (1933), No. 4, pp. 577–588*).—Observations on early, midlate, and late strains (pure line) of Kolamba rice showed that flowering in a panicle begins on the second day after emergence and proceeds from the top downward, with the spikelets blooming in a regular sequence, i.e.. the terminal spikelet generally blooms first, then the second, and thereafter flowering proceeds from below upward. Blooming in individual panicles is vigorous from 9 a.m. to 12 m., but after 12 m. it falls rapidly and few flowers open after 2 p.m. A panicle completes blooming in from 5 to 6 days, while a strain population requires from 6 to 8 days. Three phases in anthesis are described. Atmospheric conditions greatly influence anthesis in rice; clear weather hastens anthesis, whereas damp and cloudy conditions check the process.

Natural cross-fertilization in rice, B. S. KADAM and G. G. PATIL (*Poona Agr. Col. Mag., 25 (1933), No. 2, pp. 53–61*).—Natural crossing in rice was observed at the Karjat Rice Breeding Station to range from 0 to 4.3 percent in a number of varieties and to vary from season to season, averaging about 0.5 percent.

The classification of Burmese sesamums (Sesamum orientale Linn.), D. RHIND and U. B. THEIN (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 478–495, pl. 1*).—Differences between early (monsoon) and late (winter) varieties of sesamums are pointed out with results of crosses between the two types, indicating that the late character is dominant with one principal gene involved. Associations between various characters are shown. Thirty-four types of early and 15 of late sesamums are described and classified.

Studies in sorghum—the great millet.—II, Anther, stigma, and grain colour affinities, G. N. R. AYYANGAR, C. VIJIARAGHAVAN, M. A. S. AYYAR, and V. P. RAO (*Indian Jour. Agr. Sci., 3 (1933), No. 4, pp. 605–608, pl. 1*).—Further observations (E.S.R., 66, p. 824) revealed that fresh anther colors vary in yellow from deep to very light, corresponding to similar gradations of color on the stigmas. Pollen grains vary in color and are deep yellow in red-kerneled plants and correspondingly lighter in plants with the lighter-colored kernels. Anthers color when dry, the colors appearing earlier than and paralleling the later developing kernel colors. White kernels could be classified into subgroups on the basis of their dry anther colors.

Further studies of size and shape of plot in relation to field experiments with sugar beets, F. R. IMMER and S. M. RALEIGH (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 8, pp. 591–598, fig. 1*).—In a further study on the size and shape of plat in relation to field experiments with sugar beets, made by the U.S.D.A. Bureau of Plant Industry cooperating with the Minnesota Experiment Station, the design of the experiment was essentially the same as that employed earlier (E.S.R., 67, pp. 520, 521). The standard errors in percentage of the mean decreased as the size of plats increased. When the entire plat was harvested, efficiency in the use of the land decreased as the size of plats was increased. When a single border row was removed on each side of the plat, the 4-row plat was decidedly the most efficient. The regression of yield of all plants in a plat on the total number of beets was essentially linear.

Sugarcane varietal trials for selecting suitable improved types, T. S. Venkatraman and S. A. Hussainy (*Agr. and Livestock in India, 3 (1933), No. 1, pp. 1–15, pls. 8*).—Methods of testing new sugarcanes against local standards with the object of selecting improved adapted types, used successfully by the Imperial Sugarcane Breeding Station at Coimbatore, include periodic observations, photographs, weighings, root dissections, and rather simple juice analyses during ripening.

Sugarcane for sirup production, E. W. Brandes, S. F. Sherwood, and B. A. Belcher (*U.S. Dept. Agr. Circ. 284 (1933), pp. 48, pl. 1, figs. 15*).—Replacing Farmers Bulletin 1034 (E.S.R., 40, p. 830), this publication gives information on sugarcane varieties for sirup production; the soil, fertilizer, rotation, and cultural needs of the crop; harvest and storage practices; and on diseases and insect pests of sugarcane. The equipment and labor requirements for cane production and making sirup are indicated, with remarks on marketing the sirup and using the byproducts. Mosaic-resistant varieties imported or bred by the Department, including Cayana, P.O.J. 213, P.O.J. 36–M, and C.P. 807, have restored acre yields of sirup to former levels or higher.

Varieties of club wheat, J. A. Clark and B. B. Bayles (*U.S. Dept. Agr., Farmers' Bul. 1708 (1933), pp. [2]+12, figs. 6*).—Information superseding that in Farmers' Bulletin 1303 (E.S.R., 49, p. 335) is given on the characteristics and distribution of 12 varieties of club wheat. Hybrid 128, Albit, Jenkin, and Hybrid 123 are described as outstanding varieties, while Hybrid 143, Little Club, Big Club, Redchaff, and several other white-kerneled spring wheats, formerly important, are being replaced by more productive varieties.

Varieties of wheat in Australia, J. R. A. McMillan (*Aust. Council Sci. and Indus. Res. Bul. 72 (1933), pp. 28, pl. [1]*).—This catalogue lists approximately 1,160 varieties and strains of wheat grown in Australia, with their pedigrees or sources and a genealogical chart showing the relationship of the more important varieties.

Milling and baking properties of the wheat varieties in U.S.S.R. [trans. title], K. M. Chingo-Chingas (Tchingo-Tchingas) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant Breeding), 1931, Sup. 46, pp. 455, figs. 36; Eng. abs., pp. 401–455*).—Detailed report is made on the milling and baking qualities of numerous varieties of common and durum spring wheat and of winter wheat tested from 1923 to 1928. The best varieties of each type for the different regions are pointed out, and the influence of the region, rainfall, and irrigation on the milling and baking quality of wheat and the influence of protein in the grain on the baking quality of the flour are discussed at some length.

Electrolysis of seed of cereals, J. G. C. Fraser and L. M. Pidgeon (*Sci. Agr., 14 (1933), No. 3, pp. 141–148*).—Laboratory and field studies on treatment of Huron Ottawa 3 wheat by the Wolfryn process failed to show any advantage due to the treatment, agreeing with results at Rothamsted described by Russell (E.S.R., 44, p. 519).

Results of seed tests for 1933, B. G. Sanborn and L. J. Higgins (*New Hampshire Sta. Bul. 276 (1933), pp. 18*).—The percentages of purity and germination are tabulated for 384 official samples of field crops seed collected from dealers in New Hampshire during the year ended June 30, 1933.

Agricultural seed, A. S. Lutman (*Vermont Sta. Bul. 365 (1933), pp. 23*).—The purity and germination guaranties and important variations therefrom are tabulated and discussed for 452 samples of agricultural seed collected from dealers in Vermont during 1933. The weed problem also is commented on.

HORTICULTURE

[Horticultural studies by the Bureau of Plant Industry] (*U.S. Dept. Agr., Bur. Plant Indus. Rpt., 1933, pp. 2, 3, 4, 5, 6–8, 10, 22*).—Herein are presented brief reports of investigations upon factors affecting color in apples; stocks for Satsuma oranges; pollination of dates; growth and development of peaches; precooling of pears; protection of fruit in transit from freezing; storage, handling, and utilization of Kieffer pears; breeding of strawberries; use of carbon dioxide in storage of fruits and vegetables; the relation of foliage to the filling of pecans; pollination of the Persian walnut; development of a mosaic-resistant bean of the Refugee type; selection of yellows-resistant cabbages; breeding of disease-resistant lettuces and muskmelons; effect of fertilizers on quality of peas; relation of quality of vegetables as harvested to their canning value; and the value of clean culture with little or no pruning for shelter belt trees at Mandan, N.Dak.

Fruits and vegetables (*N.J. Agr., 15 (1933), No. 1, pp. 4, 5*).—As reported by J. T. Clark, mulching of well fertilized raspberries with salt hay greatly increased yields. The temperature underneath the mulch was from 13° to 20° [F.] less on July 15 than in neighboring unmulched areas. At the same date the unmulched soil contained only about 63 percent as much water in the upper 6 in.

In tomato breeding a cross of Marglobe × J.T.D. appeared particularly promising as a juice tomato from the viewpoint of flavor and internal color.

[G. T.] Nightingale found that 2-year-old apple trees in sand absorbed nutrient salts within 3 to 4 hours after their application.

As determined by C. S. Beckwith, a mixture of 300 lb. of nitrate of soda, 300 lb. of dried blood, 1,200 lb. of rock phosphate, and 200 lb. of sulfate of potash applied at the rate of 800 lb. per acre was excellent for blueberries.

Studies in plant propagation: The influence of chemicals, of the medium, and of the position of the basal cut on the rooting of evergreen and deciduous cuttings, L. C. Chadwick (*[New York] Cornell Sta. Bul. 571 (1933), pp. 53, figs. 7*).—Variable results according to plant material, rooting media, type of cuttings, and chemical treatment were obtained in investigations continuing over a period of 4 years and involving more than 80,000 cuttings of different ornamental species.

Soaking cuttings in solutions of either sucrose or potassium permanganate was effective in stimulating the growth of roots on cuttings of *Taxus cuspidata, Ligustrum vulgare,* and *Ilex verticillata.* Of the two stimulants, potassium permanganate was most effective. In many cases solutions of the permanganate applied to the rooting medium at the rate of 2 to 4 l per square foot 24 hours prior to insertion of the cuttings increased rooting and also reduced loss from damping-off. Potassium permanganate was effective in inhibiting callus growth and thereby increasing root production, and was also effective in inducing a grouping of the roots at the base of the cutting.

Concerning media, yew cuttings rooted better in either sand or peat moss than in a combination thereof. However, with those junipers which naturally develop exceptionally large callus growths, with *Thuja plicata,* and with deciduous softwoods a sand and peat mixture gave best results. Peat moss did not prove a desirable medium for cuttings of most deciduous plants. Under the same environment the temperature of the peat was consistently 3° to 4° [F.] higher than that of sand.

With regard to the effect of the position of the basal cut, 0.5 in. below the node proved superior with 41 of the 86 common shrubs tested as compared with 17 which rooted best with a cut at the node. In 23 cases the position of the cut was unimportant. In some cases the position of the basal cut influenced the number of roots and in other cases functioned only as a time factor.

Some observations on the assimilation of ammonium and nitrate nitrogen in some horticultural plants, V. A. Tiedjens (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 253, 254*).—At the New Jersey Experiment Stations the H-ion concentration of the nutrient medium was observed to exert a controlling influence on the assimilation of nitrogenous salts. Nitrate ions were assimilated most satisfactorily in both the tomato and apple from nutrient solutions of approximately pH 4 and ammonium ions from solutions of pH 5 to 6.5. The larger the amount of available carbohydrate in the plant, the more rapid was the assimilation of ammonium ions. In general, ammonium and nitrate salts produced equally good growth under conditions favorable for each. Where both ammonium and nitrate ions were present in the nutrient solution, apples and tomatoes assimilated both in proportions directly related to the pH of the solution. On acid soils having a pH of 4, plants tended to accumulate ammonium and assimilate nitrate ions, with a reverse situation on neutral or slightly alkaline soils.

Growth-differentiation balance vs. carbohydrate-nitrogen ratio, W. E. Loomis (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 240–245*).—The author proposes a concept, herein designated as the "growth-differentiation balance", based on the assumption that plant development is divided into two phases, (1) the period of increase in size due to cell division and cell enlargement, and (2) the sum of the chemical and morphological changes which start during cell enlargement and terminate with cell death. At proper temperatures growth depends upon moisture and the supply of synthesized protoplasm-building materials, whereas differentiation apparently depends on sugar concentration of the cell sap of differentiating cells or upon substances closely related. The difference between the new concept and the carbohydrate-nitrogen balance is discussed.

[Seed treatment], C. M. Haenseler (*N.J. Agr., 15 (1933), No. 2, pp. 5, 6*).—Formaldehyde dust incorporated into the upper soil layer prior to sowing seed proved highly effective at the New Jersey Experiment Stations in preventing seed decay and damping-off of the young seedlings. Crucifers, lettuce, and possibly certain other vegetables were sensitive to formaldehyde and required a less concentrated material.

Ethylene treatment of fruits and vegetables (*U.S. Dept. Agr., Bur. Chem. and Soils Rpt., 1933, p. 17*).—Data are reported on the effect of ethylene treatment on the Japanese persimmon and on tomatoes.

Mulch paper in vegetable production, A. E. Hutchins (*Minnesota Sta. Bul. 298 (1933), pp. 20, figs. 8*).—Experiments conducted over a period of three years with many different vegetables showed that mulching with Type A Gator Hide paper increased the yield of certain crops and decreased that of others as compared with clean culture. Among the most favorably affected crops were cucumbers, Telephone peas, spinach, potatoes, and radishes. Among crops unfavorably influenced by paper were eggplants, tomatoes, White Globe turnips, and onions. Paper mulch led decidedly in the number of crops benefited, but in many cases the increases were insufficient to offset the added costs.

Data on the seasonal distribution of yields showed no material increase in early production of paper-mulched tomatoes. Early yields of cucumbers were, on the other hand, greatly increased in all three years. Sweet corn was favorably influenced by paper in two of three years. The methods of placing and anchoring paper are discussed.

[Nutrients for mushrooms] (*N.J. Agr., 15 (1933), No. 1, pp. 6, 7*).—Studies by S. A. Waksman on the processes of decomposition of stable manure showed a loss in water soluble substances, carbohydrates, celluloses, hemicelluloses, fats, and waxes and a percentage increase in lignins and minerals. Urea and ammonia, undesirable from the standpoint of mushroom culture, were partly transformed into usable proteins. During the development of the mushrooms more than three fourths of the lignin and nearly one half of the protein in the manure was utilized, leaving, however, a residue valuable as a top-dressing for grass.

Effect of excess carbon dioxide on growing mushrooms, E. B. Lambert (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 8, pp. 599–608, figs. 6*).—Laboratory experiments conducted by the U.S.D.A. Bureau of Plant Industry with mushrooms growing under bell jars, the atmosphere of which was modified with respect to carbon dioxide, showed that concentrations of 5 percent or above resulted in abnormal development and sometimes death. The minimum injurious concentration was 1 percent. Since neither moderate dilution of the atmosphere with nitrogen nor the supplying of an excess of oxygen had any material influence on growth, the author concludes that oxygen in itself is not directly concerned with injury. Mushrooms were found more sensitive to high concentrations of carbon dioxide surrounding the sporophores above ground than to similar concentrations in the interstices of the soil compost.

Analyses of the air of commercial mushroom houses showed that a concentration of carbon dioxide of 0.2 to 0.5 percent at ground level is possible after the doors have been closed for several hours. It is believed, however, that with systematic ventilation the minimum injurious concentration of 1 percent of carbon dioxide may be easily avoided.

Experiments in K and P deficiencies with fruit trees in the field, O. Lilleland (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 272–276, figs. 2*).—Of many organic and inorganic fertilizer materials and other chemicals, such as stable manure, dried blood, calcium nitrate, sodium nitrate, ammonium sulfate, iron sulfate, copper sulfate, potassium sulfate, and potassium chloride, tested by the California Experiment Station as possible controls for scorching, premature defoliation, and frequent death of prune trees, only those containing potassium gave any beneficial response. In no case were trees advanced to the die-back stage improved by potassium, but the onset of scorch in healthy trees was delayed for one or two years.

The removal of the entire crop early in the season prevented the trouble from developing, but analyses of the leaves of bearing trees did not reflect the level of potassium nutrition accurately enough to predict the possibility of die-back development. At the time scorch appeared the pruned fruits were withdrawing their maximum amounts of potash.

J. H. Hale peaches growing in a soil exceedingly low in phosphorus and heavily fertilized with treble superphosphate developed large dark leaves in early season, but by August the foliage took on a yellowish cast, presumably a result of a depression in nitrogen absorption due to the phosphorus. The time of bloom and of ripening and the amount of shoot growth were unaffected.

Some effects of deficiencies of phosphate and potassium on the growth and composition of fruit trees under controlled conditions, D. R. Hoagland and W. H. Chandler (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 267–271, figs. 2*).—As observed by the University of California with prune, peach, and other fruit trees growing in steel cylinders provided with drainage tubes, heavy application of potassium completely prevented the appearance of leaf scorch and reduced by approximately 90 percent other symptoms associated with die-back of prune trees. As revealed by determinations of inorganic substances, the leaves of the various treated trees reflected the availability of potash in the soil. Increased absorption of potash was accompanied by decreased absorption of calcium or magnesium, or both. The authors believe that the effect of potash lies primarily in its influence on the relation between calcium, magnesium, and potash and not on the soil reaction. An apparent tendency was noted for low potash of the leaf sap to be accompanied by increased H-ion concentration.

In the case of the Tuskena peach a deficiency of phosphorus resulted in restricted growth and purplish tints in the leaves. Potassium-deficient trees made more growth than complete-nutrient trees, but the leaves were light in color and mottled and late in the summer developed dead tips. The fruit of phosphate-deficient trees was characterized by early maturity, dark spots, and rapid decay, while that of potassium-deficient trees matured slowly with a notable lack of color.

Spray residue removal (*N.J. Agr., 15 (1933), No. 5, pp. 4, 5*).—Difficulty in removing lead residues from fruit sprayed with oil-lead arsenate sprays was solved by H. C. McLean by the addition of a textile wetting and degumming agent to the hydrochloric acid wash. The drying of apples after washing was not found entirely essential from the standpoint of appearance and keeping. Fruits were washed at an approximate cost of 0.5 c. per bushel.

Some effects of different cultural methods upon root distribution of apple trees, J. H. Gourley (*Ohio State Hort. Soc. Proc., 66 (1933), pp. 16–21, figs. 3*).—Studies in four Ohio Experiment Station orchards, two in sod, one cultivated with a rye cover crop, and the fourth divided between culture and permanent mulch, showed little difference in root distribution under sod and under cultivation plus cover crops. However, in the layer of permanent mulch, which had been accumulating for 35 years, there were thousands of fibrous roots. At a point 8 ft. from the trunk a square foot of mulch about 3 in. thick contained 59 g of roots, mostly less than 1 mm in diameter. Furthermore, as many or more roots were present in the soil horizons under the mulch as in corresponding locations in unmulched orchards. Averaging records for all trees, there were 411 fibrous roots in the surface foot of soil, 225 in the second, 98 in the third, 61 in the fourth, 44 in the fifth, and 6 in the sixth foot. Larger roots were distributed in the same proportions. Outwards from the trunk there was a decreasing gradient in the number of roots, indicating that fertilizer should be distributed uniformly over the entire area occupied by the tree and not simply under the branch extremities.

Some effects of different cultural methods upon root distribution of apple trees, J. Beckenbach and J. H. Gourley (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 202–204*).—The subject matter is identical with that of the above paper of the same title.

Soil acidity and orchard production, J. Oskamp and L. P. Batjer (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 188–192, figs. 2*).—Electrometric determinations by Cornell University on soils beneath Baldwin and Rhode Island Greening apple trees in an orchard in Ontario County and in 58 orchards in Monroe County showed a general tendency for Baldwin yields to increase as the soil acidity increased. In the Ontario orchard the coefficient of correlation of yield with pH value was —0.410±0.081. In the case of Rhode Island Greening trees in the same orchard the correlation coefficient was —0.175±0.095. In the 58 orchards Baldwin yields were correlated with pH to the extent of —0.312±0.082. The authors believe that Baldwin trees do not respond directly to soil acidity but probably to drainage conditions accompanying soil acidity.

Absorption, utilization, and recovery of nitrogen, phosphorus, and potassium by apple trees grown in cylinders and subjected to differential treatment with nutrient salts, W. THOMAS (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 8, pp. 565–581, figs. 2*).—Analyses at the Pennsylvania Experiment Station of representative Stayman Winesap apple trees from the cylinder fertilizer experiment (E.S.R., 67, p. 253) revealed important differences in the assimilation of N, P, and K as related to the nutrients supplied. The percentage and absolute amounts of each of the three elements absorbed by the trees and also the ratio in which they were absorbed varied with nutrient treatments and to some extent with the cultural treatment, namely, sod or tillage. The omission of any one of the three elements, N, P, or K, from the nutrient medium was followed by a decreased absorption of the others, with the result that growth and flowering were generally reduced. The influence of N, P, and K varied somewhat according to the accompanying elements. The percentage recovery by trees of added N, P, and K was relatively low in all instances and was apparently influenced in part by soil properties (the leaching of nitrates and the fixation of P and K). A ratio of 6:1:4 (NPK) was apparently most favorable for optimum growth and flowering.

Relation of soil moisture to fruit bud formation in apples, E. S. DEGMAN, J. R. FURR, and J. R. MAGNESS (*Amer. Soc. Hort. Sci. Proc.*, *29* (*1932*), *pp. 199–201, figs. 2*).—Under the conditions of a very dry summer (1930) in which nonirrigated trees suffered seriously, irrigated Rome Beauty and Oldenburg trees in an experiment laid out by the U.S. Department of Agriculture near Hancock, Md., yielded on an average approximately twice that of the controls. The result was due in part to the greater number of fruits per tree but more largely to the increased size of individual apples. In 1931 the trees on the nonirrigated area produced a higher percentage of blossoms. Correlation charts showed that fruit bud formation in the Oldenburg was almost entirely independent of soil moisture conditions, while in Rome Beauty there was a tendency for the nonirrigated trees to form more fruit buds. Apparently fruit bud formation could be influenced later in the season in Rome Beauty than in Oldenburg. In the case of devitalized York Imperial and Wealthy trees unable to size a heavy crop in 1929, irrigation in 1930 increased fruit bud formation.

Effects of leaf area, nitrate of soda, and soil moisture on fruit bud formation in the Delicious apple, C. P. HARLEY, M. P. MASURE, and J. R. MAGNESS (*Amer. Soc. Hort. Sci. Proc.*, *29* (*1932*), *pp. 193–198, figs. 2*).—Studies by the U.S. Department of Agriculture in a 13-year-old Delicious orchard at Orondo, Wash., to which no fertilizer was applied in the 2 years preceding the investigations showed a very definite relationship between the number of leaves subtending fruits on both ringed and unringed limbs and fruit bud formation. Spurs on ringed limbs with 10 leaves per apple failed to differentiate a single fruit bud, regardless of spur type, fertilizer, or irrigation treatment. With 70 leaves practically 100 percent of all spurs formed fruit buds irrespective of treatment. Whereas vegetative and blossoming spurs on unringed branches functioned very similarly to those on ringed branches with 30 leaves per fruit, the latter formed fruit buds on about 37 percent of the fruiting spurs as compared with 3 percent for the unringed branches.

Under the conditions of the test, fruit bud differentiation extended in the Delicious from the middle of June until well into August. Adequate soil moisture and nitrogen are considered important, but within the limits of the study did not appear to directly influence fruit bud formation.

Apple pollination studies in the Annapolis Valley, N.S., Canada, 1928–1932, W. H. BRITTAIN ET AL. (*Canada Dept. Agr. Bul. 162, n. ser.* (*1933*), *pp.*

198, pl. 1, figs. 73).—Based on comprehensive studies extending over several years, the conclusion is drawn that all apple varieties grown in Nova Scotia require insect visitation for satisfactory pollination, although Baldwin did yield a fair crop with self-pollination. Varieties divided rather sharply into good or poor pollen producers, the latter being of little value in pollination and the former useful wherever the respective periods of blossoming overlapped sufficiently and the trees were properly arranged in the orchard. The principles and technic of pollination are discussed, with special reference to the role of hive bees and the hazards of destroying bees and other beneficial insects during spraying.

Seed content, seedling production, and fruitfulness in apples, W. H. Brittain and C. C. Eidt (*Canad. Jour. Res., 9 (1933), No. 4, pp. 307–333, pls. 2, figs. 4*).—In this study, carried on in part at the Dominion Experimental Station, Kentville, Nova Scotia, more seeds were found in picked than in drop apples of four varieties, Gravenstein, King, Baldwin, and Northern Spy, suggesting a correlation between seed development and fruit setting. Of the four varieties Northern Spy produced the most seed per apple. Gravenstein in some cases produced well formed, large size fruits without any fertilized seeds. No correlation was established between seed content and weight of fruit except in Northern Spy, and here only slightly. Lop-sided apples had less than average seed count and more empty carpels.

A summation of results in terms of fruit set, seeds, and seedlings of various crosses, diploid × diploid, diploid × triploid, triploid × diploid, and triploid × triploid, showed all varieties to be fruitful when diploids were used as pollen parents. Triploids × triploids were generally productive, but all varieties were less fruitful when fertilized with triploid pollen. Seedling production was in much the same order, that is, diploid × diploid was the most productive.

Bruising and freezing of apples in storage and transit, D. H. Rose and J. M. Lutz (*U.S. Dept. Agr., Tech. Bul. 370 (1933), pp. 15, pls. 7, fig. 1*).—A type of injury characterized by large flattened, discolored areas and often observed at the bottom of loads of boxed apples after transportation in railroad cars was reproduced at both freezing and nonfreezing temperatures by jolting apples in commercially packed boxes with and without applied pressure. The injuries produced at freezing and nonfreezing temperatures were indistinguishable except in occasional apples in which the bruises of frozen fruits were observed to be somewhat softer.

The lining of apple boxes with corrugated paper eliminated practically all the bruising or transit injury under both laboratory and actual transit conditions. Corrugated paper pads placed at the end of barrels before heading failed to prevent bruising and the transit type of injury. Cork, lith, or Celotex placed under the bottom layer of boxes proved of no value in laboratory tests in preventing the transit type of injury.

Preliminary report of pear tree responses to variations in available soil moisture in clay adobe soil, W. W. Aldrich and A. Work (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 181–187, figs. 2*).—Anjou pear trees 15 years old growing on a clay adobe soil at the Medford, Oreg., Substation and irrigated as follows: (1) Once on August 12, (2) four early applications, (3) three late applications, and (4) seven applications throughout the season, responded definitely to water modifications. No plat actually reached the permanent wilting point, although the upper foot of the one-irrigation plat approached wilting during the first 12 days of August. Apparently in the heavy soil moisture did not always move to the roots as rapidly as required by the trees, so that availability rather than actual shortage became the limiting factor. The rate of fruit growth was significantly reduced when the soil contained approximately 50 percent of its maximum available water in the upper 3 ft. Differences in daily duration of the period of stomatal opening were found to be correlated with differences in available soil moisture well above the wilting point. Trunk and shoot growth were significantly less in the one-irrigation plat than in any of the others.

Artificial culture of abortive cherry embryos, H. B. Tukey (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 238, 239*).—This is a brief summary of studies more completely reported in earlier papers (E.S.R., 69, p. 214).

[The Golden Jubilee peach], M. A. Blake (*N.J. Agr., 15 (1933), No. 2, p. 4*).—A brief account is given of the origin of the Golden Jubilee peach, a second generation, open-pollinated seedling from an original Greensboro × Elberta cross made by the New Jersey Experiment Stations in the spring of 1915.

Peach hardiness, M. A. Blake (*N.J. Agr., 15 (1933), No. 4, pp. 4, 5*).—Cold weather at the New Jersey Experiment Stations, 3° F. below zero, on February 13, following a moderate January, killed 95 percent of the fruit buds of Elberta and J. H. Hale peaches and severely damaged Augbert (Early Elberta), Brackett, Kette, and Shippers Cling. Seedlings with J. H. Hale or Elberta, or both, in their parentage suffered severely. On the other hand, Oriole, Radiance, Greensboro, and Early Wheeler escaped with no more than 10 percent injury.

Effects of temperature on peaches, M. A. Blake (*N.J. Agr., 15 (1933), No. 4, p. 5*).—Young Elberta trees grown in the University of Chicago greenhouses at a temperature of 52° F. accumulated carbohydrates in large quantities due to the low rate of respiration and high rate of photosynthesis. At 95° trees respired for a time at a high rate with a constant depletion of carbohydrates. This rate soon slowed down, due to a lack of respirable material.

Abscission of peach buds [trans. title], F. Cocchi (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 13 (1933), No. 2, pp. 190–202, fig. 1; Eng. abs., p. 202*).—Studies at the Plant Pathology Station, Firenze (Florence), Italy, of the causes of dropping of Amsden and Mayflower peach buds prior to their opening led to the conclusion that the cause was physiological rather than pathological. Apparently mild winters prevented the trees from undergoing the normal rest period. It is suggested that only slight pruning be given peach trees in the spring, with the more severe treatment in summer.

Peach thinning, J. S. Shoemaker (*Ohio State Hort. Soc. Proc., 66 (1933), pp. 162, 163*).—Investigations conducted at the Ohio Experiment Station in a heavy crop year (1931) and a good crop year (1932) indicated that the importance of peach thinning is greatest in years of heavy production. A significant feature was that Elberta trees thinned early in 1931 and again in 1932 produced twice as much fruit in 1932 as those thinned late and four times as much as the trees not thinned either year. In 1931 early thinning had more effect than late thinning in increasing the size of the fruits.

The influence of storage temperatures on the dessert and keeping quality of peaches, P. L. Harding and M. H. Haller (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 277–281, figs. 2*).—Carman, Belle, Elberta, and J. H. Hale peaches, obtained near Leesburg, Va., and stored in the experimental plant at Arlington Experiment Farm, were found to develop good dessert quality after storage at 32° F. for from 1 to 2 weeks if permitted to soften at 70°. With 3 weeks at 32° the fruits lost quality, rating only fair or below. When held continuously at 50° peaches softened after 15 to 20 days with poor quality. Storage at 36° to 40° resulted in a high percentage of breakdown, developing either in storage or during the subsequent ripening.

Varietal behavior of strawberries and peaches preserved by frozen pack methods, J. S. Caldwell, J. M. Lutz, and H. H. Moon (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 282–286*).—Supplementing information presented in another paper (E.S.R., 70, p. 50), the results are presented of an examination of 18 peaches and 64 strawberries stored at Arlington Experiment Farm, Va., in the frozen state in air-sealed and liquid-tight containers. In any single variety the color of the product was distinctly superior in the sealed packages. Comparing rapid freezing in which the temperature at the center of the package reached 27° F. in about 1 hour with slow freezing (6 to 8 hours), no advantage was seen for the former; in fact in certain varieties of rapidly frozen peaches the color, odor, and flavor after thawing were less desirable.

Marked differences were found in varieties with respect to their adaptation for freezing storage. Big Joe, Klondike, Brandywine, Blakemore, and Redheart were the best strawberries, and J. H. Hale, Reeves, Chairs, St. John, and Up-to-Date the best peaches.

Strawberry culture: Eastern United States, G. M. Darrow (*U.S. Dept. Agr., Farmers' Bul. 1028, rev. (1933), pp. II+37, figs. 18*).—A revision of an earlier edition (E.S.R., 40, p. 838), this presents information on planting, fertilizing, cultivating, mulching, harvesting, growing, and utilization of strawberries. A section on cold storage was prepared by D. F. Fisher.

Twelve years of strawberry breeding, G. M. Darrow, G. F. Waldo, and C. E. Schuster (*Jour. Heredity, 24 (1933), No. 10, pp. 391–402, figs. 5*).—In summarizing the strawberry work of the U.S. Department of Agriculture begun in 1920, the authors set forth the main objectives of the project and discuss in detail the technic employed in selecting parents, in pollination, in growing and handling seedlings, and in the selection of desirable plants for increase. The characters which are considered in selection are set forth, with particular reference to resistance to leaf spot, virus-carrying aphids, and bud weevil. Very slight differences in the fertility of the soil, in the site, or in the time of planting were found to influence greatly the percentage of leaf spot infection. The percentage of weevil-cut flower buds ranged at Glenn Dale, Md., from 43 percent in Ettersburg 121 to 2 percent in Bellmar. A positive correlation noted between pollen production and weevil injury varied sufficiently with varieties to indicate the possibility of breeding abundant pollen producers with resistance.

Fruits and vegetables, J. H. Clark (*N.J. Agr., 15 (1933), No. 5, pp. 3, 4*).—A brief account is given of the scope and progress of strawberry breeding at the New Jersey Experiment Stations. Among parents, Fairfax excelled in the percentage of high quality seedlings, and Aberdeen and Howard 17 yielded productive, vigorous, early-ripening seedlings, often lacking, however, in firmness and good quality. Lupton transmitted size and attractiveness but poor quality. Gandy seedlings were late but rather unproductive.

[Soil reaction for strawberries], J. H. Clark (*N.J. Agr., 15 (1933), No. 2, p. 6*).—At the New Jersey Experiment Stations Howard 17 strawberries grown in pure quartz sand and supplied with a constant drip nutrient solution, the acidity of which ranged from pH 3.4 to pH 6.4 in steps of 0.6 pH, were found to have different acidity optimums dependent on the kind of nutrients. In the nitrate series the best growth was made at pH 4.6 and in the ammonia series at pH 6.4, the maximum employed.

Fertilizer experiments on strawberries, with a presentation of statistical methods for calculating the significance of plot yields, L. P. Latimer and S. W. Wentworth (*New Hampshire Sta. Tech. Bul. 55 (1933), pp. 22*).—Opening with a summary of the present status of knowledge upon the nutritional requirements of the strawberry and a discussion of statistical methods for calculating the significance of crop yields, the authors analyze the results of 10 years of strawberry fertilizer work at the station. Considering all the data, only three treatments, namely, manure, nitrogen plus phosphorus, and potash gave increased yields above the controls. Five treatments, namely, NCa, P, N, NPK, and NK, actually decreased yields. It was obvious that mineral nitrogen and potassium chloride may, under certain conditions, prove harmful to strawberry plants. Phosphorus on the other hand in no case proved deleterious, and the evidence was that when combined with nitrogen and manure it may be actually beneficial. The practical suggestion is set forth that mineral nitrogen and potash should not be used for strawberries until a more thorough study has been made of their effects under various conditions of application and environment.

Measurements on Senator Dunlap plants set in 1922 and fertilized in September and again in May showed that nitrate of soda increased leaf area by approximately 20 percent. A greater tendency for wilting in the nitrogen fertilized plants, particularly during the harvest period, indicated that the larger leaf area may be actually detrimental in critical periods.

Blueberry nutrition, J. W. Shive (*N.J. Agr., 15 (1933), No. 4, p. 6*).—Rooted blueberry cuttings grown at the New Jersey Experiment Stations in pots of sand supplied continuously with nutrient solution thrived and fruited. However, where boron or manganese were completely lacking in the cultures the plants showed definite deficiency symptoms. The blueberry was tolerant to rather wide differences in salt proportions.

Water on cranberry bogs, C. S. Beckwith (*N.J. Agr., 15 (1933), No. 3, p. 5*).—Holding the water until July 5 eliminated the current crop but at the same time eradicated nearly all the harmful insects. Frequently the larger crop of the succeeding year offset some of the money loss.

Comparative mineral contents of Philippine bananas: Calcium, iron, magnesium, and phosphorus, J. R. Martinez (*Philippine Agr., 21 (1933), No. 8, pp. 547–550*).—Largely in tabulated form, there are presented the results of analyses of 20 varieties of bananas in which phosphoric acid, calcium oxide, ferric oxide, and magnesium oxide in the ash averaged 20.32, 1.72, 1.14, and 6.97 percent, respectively.

Influence of smudging on the respiration and catalase activity of the mango, Mangifera indica Linn., L. G. Gonzalez (*Philippine Agr., 21 (1933), No. 8, pp. 533–540, fig. 1*).—Further evidence (E.S.R., 49, p. 835) was found that smudging is an effective means for bringing mango trees into bloom. By covering certain limbs with test tubes and paraffined bags reasonable proof was obtained that heat and not carbon dioxide or other products of combustion was the primary factor in inducing flowering. Smudging increased the rate of respiration of the leaves and twigs and brought about a slight but consistent increase in catalase activity of the leaves, terminal buds, and bark, and marked increases in catalase activity in the wood.

An experimental shipment of navel oranges to Canada, W. J. Young and F. M. Read (*Jour. Dept. Agr. Victoria, 30 (1931), No. 12, pp. 590–593, figs. 2*).—Shipped from Melbourne to Montreal in the ordinary refrigerated space which had no ventilation system but which maintained an approximate temperature of from 38° to 40° F., navel oranges dipped prior to packing in a 5 percent sodium bicarbonate solution, sprayed with paraffin, and wrapped in sulfite tissue or grease-proof paper carried with less than 4 percent wastage. At the same time comparable untreated oranges simply wrapped in grease-proof paper lost approximately 20 percent. The important diseases concerned in wastage were green mold, blue mold, and core rot (*Alternaria citri*).

The percentages of decay were greater in another lot of fruit grown in a different district but handled under comparable conditions, probably because of greater maturity at the time of shipment. A distinct loss of quality was evident as a result of the long voyage.

Nut growing in New York State, L. H. MacDaniels (*[New York] Cornell Sta. Bul. 573 (1933), pp. 24, figs. 11*).—Asserting that low winter temperatures, the length of the growing season, and the average temperature during the growing season are the important factors in nut growing in New York State, the author presents climatological data and discusses the adaptation of various species and varieties. In certain limited areas Persian walnuts fruited and the pecan survived but did not mature its nuts. The black walnut is conceded to be the most valuable species for growing over a wide area of the State. Data are presented on the yield of hazelnuts at Geneva and on the weight of nuts and kernels of several varieties of black walnuts. General culture is discussed, with particular reference to asexual propagation.

Effect of ethylene chlorhydrin vapors upon the chemical composition of gladiolus corms, F. E. Denny (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 435–440*).—Alice Tiplady, Souvenir, and Halley gladiolus corms dug September 23 and treated at intervals between September 30 and October 15 were found, before visible sprouting occurred, to be somewhat higher in sucrose than were untreated corms. Reducing sugars were sharply decreased, soluble nitrogen increased, and insoluble nitrogen decreased. The sucrose and nitrogen changes were more pronounced in Alice Tiplady and Souvenir than in Halley.

Comparative anatomical studies of Dorothy Perkins and American Pillar roses.—I, Anatomy of canes. II, Origin and development of adventitious roots in cuttings, M. C. Carlson (*Contrib. Boyce Thompson Inst., 5 (1933), No. 3, pp. 313–330, figs. 7*).—Cuttings of Dorothy Perkins taken during March and April and placed with the basal ends in water formed basal swellings and rooted freely, whereas American Pillar cuttings of the same type and handled similarly failed to form swellings or to develop roots. Anatomical studies showed that the basal swellings in Dorothy Perkins cuttings are the result of an unusual development of parenchymatous secondary phloem, and that the root primordia are initiated by small groups of cells in this parenchymatous secondary tissue, either within a bundle or between bundles. Differentiation into tissues of the root began when the primordium had pushed into the cortex of the shoot.

The starch reserves in Dorothy Perkins canes were found in every case to be greater than those in American Pillar, and it is considered likely that the activity of the cambium in Dorothy Perkins may be correlated with this higher starch content. American Pillar canes had a thicker cuticle, more vascular bundles, and a larger amount of xylem and pith than did Dorothy Perkins.

FORESTRY

Forestry and farm income, W. R. Mattoon (*U.S. Dept. Agr., Farmers' Bul. 1117, rev. (1933), pp. II+33, figs. 17*).—This is a revision of an earlier edition (E.S.R., 44, p. 147).

Ohio Forest News, [November 1933] (*Ohio Forest News [Ohio Sta.], No. 23 (1933), pp. 8, fig. 1*).—Brief items of a popular nature are presented relating to forestry, forest organizations, etc.

Relation of forests to the evaporating power of the air, P. W. Stickel (*Jour. New England Water Works Assoc., 47 (1933), No. 3, pp. 229–238, figs. 4*).—Observations by the Northeastern Forest Experiment Station at four weather stations, Cranberry Lake and Elk Lake, N.Y., Petersham, Mass., and Smyrna Mills, Me., showed in all four locations a much greater rate of evaporation in midsummer in clearings than in the adjacent forest. Even in rather small openings almost twice as much water was lost by evaporation as beneath forest cover. With respect to temperature, the forest surface duff was as much as 80 percent cooler than that in the open. Differences between open and forest top soil temperature reached nearly 25 percent in one instance.

Climatic change as a factor in forest succession, P. B. SEARS (*Jour. Forestry, 31 (1933), No. 8, pp. 934–942, figs. 3*).—Based on species determinations of pollens found in peat bogs, the author concludes that in the postglacial period the retreat of the ice was probably followed by a drying of the atmosphere, accompanied by coolness. Then came an interval of considerable humidity, followed by a second dry period characterized by greater warmth than existed in the first period.

An anatomical explanation of the Northwest coniferous climax forests, A. F. HEMENWAY (*Science, 78 (1933), No. 2028, p. 437*).—It has been suggested that the evergreen conifers have come to form the climax forests of the Pacific Northwest because they grow during the winter months. In this preliminary report from the University of Arizona, the author gives anatomical evidence that while the Oregon deciduous trees have leaves for only 2 or 3 months of that part of the year when winter is sufficiently abundant to carry on photosynthesis, the evergreens are active to a certain extent for 9 or 10 months of the year.

Stand-improvement measures for southern forests (*U.S. Dept. Agr., Forest Serv., Emergency Conserv. Work, Forestry Pub. No. 3 (1933), pp. III+37, pls. 8, figs. 6*).—Prepared by the Southern Forest Experiment Station, this pamphlet presents general information as to forest types; methods of stand improvement with reference to selective cutting, pruning, and pest control; planting; erosion control; and site improvement. Under stand improvement specific recommendations are made for the various important forest types.

Preliminary yield tables for second-growth stands in the California pine region, D. DUNNING and L. H. REINEKE (*U.S. Dept. Agr., Tech. Bul. 354 (1933), pp. 24, figs. 10*).—In response to a need of adequate tables for second-growth stands that are occupying the cut-over areas in the mixed conifer forest region of California, the authors present tables based largely on intensive studies of 311 fairly representative sample plats. Mean annual increment attained a maximum at 70 years on all the site qualities utilized. The age of culmination varied with site quality, from 95 years for site index 110 to over 150 years for site index 30. Culmination for site index 70 was attained at about 120 years. The position, range, and occurrence of the second-growth mixed conifer stands are described, and the conditions for their establishment and the relative importance of virgin and second-growth forests are discussed. The technic employed is outlined in an appendix.

Growth rate of white pine in the southern Appalachians and New England, J. T. KIMBERLY (*Jour. Forestry, 31 (1933), No. 8, pp. 946, 947, figs. 2*).—Measurements taken on white pine in northern Georgia and in southern New Hampshire showed greater diameter and height growth in Georgia, the differences being statistically significant.

Observations on the thinning of fifteen-year-old Norway pine, T. SCHANTZ-HANSEN (*Jour. Forestry, 31 (1933), No. 7, pp. 838–841*).—Remeasured in 1932, five years after the original thinning, 4 plats thinned to 4 by 4 ft., 6 by 6 ft., 7 by 7 ft., and 9 by 9 ft., respectively, failed to show any significant differences in diameter gain. The greatest average height increment was made by the 4 by 4 ft. trees, the gains in all 4 plats being inverse to the spacing.

Regarding mortality during the five years, the heavily thinned plats lost the greatest number of trees. It is pointed out that conclusions cannot be drawn, as it is likely that the trees have not had time to recover from the original drastic thinning which removed many thousands of trees per acre from each treatment.

Some factors influencing resin concentration in loblolly and slash pines, G. N. Bishop and G. D. Marckworth (*Jour. Forestry, 31 (1933), No. 8, pp. 953–960, figs. 3*).—Resin content of the sapwood of second-growth loblolly and slash pines was found by the University of Georgia to vary according to the temperature, particularly variations in the minimum temperature below 40° F. Moisture content, on the other hand, varied inversely with the resin. Resin flow in cold weather is believed affected either to a greater extent by actual decrease in production within the tree than by increased viscosity or equally by these factors. Resin content in the trees studied was lowest at the base and increased progressively upward to the crown.

Oregon grown slash pine seed, T. J. Starker (*Jour. Forestry, 31 (1933), No. 8, p. 945*).—At the Peavy Arboretum near Corvallis, Oreg., approximately half of the trees in a small plantation of slash pine (*Pinus caribea*) survived a temperature of 9° F. The possibility of building up cold-resistant strains from the survivors is discussed.

Is suppression a possible cause of bird's-eye in sugar maple? L. A. Holmberg (*Jour. Forestry, 31 (1933), No. 8, pp. 968–970*).—Observations and decade-growth measurements made by the Lake States Forest Experiment Station on 26 butt logs of sugar maple displaying more or less of the birdseye figure and on clear logs indicated that suppression is apparently associated with birdseye formation. Sixty years longer were required for the birdseye trees to reach a diameter of 18 in. than for trees in a virgin stand.

Effect of weathering upon composition of hardwood leaves, H. A. Lunt (*Jour. Forestry, 31 (1933), No. 8, pp. 943–945*).—Determinations of the differences in the composition of hickory, white oak, beech, and sugar and red maple leaves as they fell from the trees in autumn and after exposure on the ground for from 7 to 8 weeks showed that weathering increased the relative ash content in all species except beech. There was a slight relative increase in nitrogen, with little or no change in calcium. Potassium content decreased 75 percent during the weathering and phosphorus from 12 to 52 percent. These losses were apparently the direct result of leaching.

Basal fire wounds on some southern Appalachian hardwoods, R. M. Nelson, I. H. Sims, and M. S. Abell (*Jour. Forestry, 31 (1933), No. 7, pp. 829–837, figs. 5*).—Of five species, yellow poplar and white, black, chestnut, and scarlet oaks, examined by the U.S.D.A. Forest Service in a Virginia forest following a very severe fire in April 1930, the poplar was the most resistant and the scarlet oak least resistant to basal injury. The average wound on the yellow poplar trees was 1.6 and on the scarlet oak 7.2 sq. ft. Various combinations of independent variables, such as areas of the scorch, char, burn, diameter at breast height, and the product of width of discoloration by length, were found correlated with basal wounds, and a method was evolved by which it was possible to predict with a fair degree of accuracy for a similar set of injured trees the areas of the wounds. Excluded from the correlation were nonmeasurable factors, such as the time-temperature relation, the possible flue action of trees of different diameter, the inherent biological variation in individual trees, etc.

Latex and its industrial applications, F. Marchionna (*New York: Rubber Age Pub. Co., 1933, pp. XXIII+1037*).—The author has collected, classified, and abstracted the literature and patents on latex and its uses up to July 1932, and presents this material under the following chapter headings: Rubber plants, planting and cultivation of rubber, collecting and extracting latex, preservation of latex and rubber, behavior and characteristics of latex, coagulation of latex, preparation of rubber, direct use of latex in industry, artificial latex, electrodeposition of rubber, and structure of rubber.

DISEASES OF PLANTS

[Plant disease studies by the Bureau of Plant Industry] (*U.S. Dept. Agr., Bur. Plant Indus. Rpt., 1933, pp. 3, 4, 5, 9, 10, 11, 12, 13, 16, 19–22*).—Notes are presented on results of studies of navel orange scab, stem-end rot, citrus canker eradication, peach nematodes, phony peach eradication, prevention of the spread of bacterial canker by tomato seed, loose smut of barley due to *Ustilago nigra*, bacterial wilt of corn, browning of flax due to *Polyspora lini*, barberry eradication, bacterial wilt of alfalfa, root rot of cotton, downy mildew, wildfire, and root knot of tobacco, downy mildew of hops, a beech disease caused by *Nectria* sp., a new needle blight of Colorado fir, treatment for diseases of coniferous nursery stock, Dutch elm disease, white pine blister rust, and prevention of stain, mold, and decay in logs and lumber.

[Control work with plant diseases by the Bureau of Plant Quarantine] (*U.S. Dept. Agr., Bur. Plant Quar. Rpt., 1933, pp. 31, 32*).—Notes are given on progress with black stem rust, phony peach disease, Woodgate rust of pines, and white pine blister rust.

Check list of diseases of plants in Texas, J. J. Taubenhaus and W. N. Ezekiel (*Tex. Acad. Sci. Trans., 16 (1931–32), pp. 5–89*).—This list, a contribution from the Texas Experiment Station, contains data on Texas plant diseases accumulated over 16 years by the senior author. For the cultivated plants the relative importance of each disease is indicated.

Plant diseases and pests in Denmark 1932 [trans. title], G. Johansen, E. Gram, P. Bovien, A. Weber, and J. L. Schnicker (*Tidsskr. Planteavl, 39 (1933), No. 3, pp. 453–506, figs. 5; Eng. abs., pp. 505, 506*).—The report lists all attacks on record, gives climatic conditions, and discusses the 1932 situation regarding the more important diseases and insect pests of crop plants.

Recent advances in the study of plant viruses, K. M. Smith (*London: J. & A. Churchill, 1933, pp. XII+423, pl. 1, figs. 67; Philadelphia: P. Blakiston's Son & Co., 1934, pp. XII+423, pl. 1, fig. 67*).—The author presents a critical survey of the present state of knowledge of this group of plant diseases, with comparisons between plant and animal virus diseases, a full account of the technic of investigation of plant viruses and the diseases which they cause, and indications of profitable lines for future studies. The following chapter headings indicate the main subject matters covered: Symptomatology, Physical Properties, Insects in Relation to Viruses, Transmission and Spread of Plant Viruses, Physiology of Virus Diseases of Plants, Some Further Aspects of the Study of Plant Viruses, Potato Virus Diseases and Viruses, and The Virus Diseases of Plants (a descriptive account of the virus diseases of plants other than the potato, classified according to their hosts).

Etiological phytopathology, G. K. K. Link (*Phytopathology, 23 (1933), No. 11, pp. 843–862*).—The content and history of the concept etiology are described briefly and a return to its original use is advocated. A thoroughgoing etiology provides a sound biological basis for development of phytopathology as a natural science and for a comparative pathology. Through recognition that each pathic event arises out of a complex of antecedents which includes not only factors or agents external to the pathic organization under consideration, but internal ones as well, the pathic organization becomes the center of interest and analysis. Internal factors include (1) the genetic constitution and (2) the past history of the cell or tissue under analysis, as well as (3) the correlative influence upon it by other parts of the same organism. Agents or factors outside the organism as a whole are considered external pathogenic factors. The potential reaction of the organization to a particular stimulus at any given moment is defined as its disposition, and is a resultant of an interplay of its past and present internal and external factors. Through this recognition, as well as through recognition that pathic events incited by infective agents do not exhaust the field of pathology, study of infective agents ceases to be the essence of phytopathology.

The basic concepts of the terms "parasite" and "infection" are discussed and a brief history of the former is given. The etiological approach is deemed to provide a sound basis for classification, not only of pathic events but of control measures as well.—(*Courtesy Biol. Abs.*)

Plant tumors and their excitant, Pseudomonas tumefaciens, I, II [trans. title], C. Stapp and H. Bortels (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 3 (1931), No. 4, pp. 654–663, figs. 7; 4 (1931), No. 1, pp. 101–125, figs. 24*).—Part 1 of this study deals with tumor formation in the host plants, with the conclusion that the blooming and fruiting of plants inoculated with *P. tumefaciens* checks tumor formation and also greatly influences the form of the tumors already established.

Part 2 deals with the life cycle of *P. tumefaciens*.

Plant tumors and their excitant, Pseudomonas tumefaciens, III [trans. title], C. Stapp and H. Bortels (*Zentbl. Bakt.* [*etc.*], *2. Abt., 88 (1933), No. 13–16, pp. 313–319, figs. 6*).—Twenty plants each of *Pelargonium zonale* (variety Schöne Ulmerin), *Solanum lycopersicum*, and *Datura stramonium* were inoculated in the greenhouse with *Pseudomonas tumefaciens*. Five plants each of the three series immediately and five each four weeks after inoculation were ringed by Lakhovsky's copper wire method. A further 5 plants of each series were treated with X-rays after development of tumors. In no case did the copper wire ringing lead to curing of the plant or to death of the tumor, nor did the X-ray treatment have any visible effect on tumor or plant.

Effect of certain environmental factors on the germination of the sporangia of Physoderma zeae-maydis, R. K. Voorhees (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 8, pp. 609–615*).—From 300 to 500 sporangia of *P. zeae-maydis*, collected from infected corn plants at the Florida Experiment Station and placed in Syracuse dishes containing distilled water, were subjected to various controlled environmental conditions between 27° and 33° C. Under such conditions continuous exchange of fresh air did not appear essential for germination. The sporangia germinated well in indirect sunlight and artificial light but did not germinate in total darkness. Direct sunlight was lethal. Germination was not obtained in distilled water adjusted to pH 2.5, the optimum reaction being pH 7.4. Sporangia stored in the laboratory for one and two years germinated 70 and 46 percent respectively. Germination was best in atmospheres containing 20 percent oxygen by volume and 10 percent carbon dioxide by volume. No germination was obtained in the absence of either oxygen or carbon dioxide or with 35 percent of carbon dioxide. The sporangia germinated after exposure to 0° and 70° for 30 days, but no germination occurred after 15 days exposure to 80°.

The Polyporaceae of Pennsylvania.—I, The genus Polyporus, L. O. Overholts (*Pennsylvania Sta. Bul. 298 (1933), pp. 28, figs. 34*).—A total of 83 species and several varieties are included in this taxonomic résumé of forms of

Polyporus found in Pennsylvania. A key with brief descriptive notes appended is presented for their identification and information given as to the distribution of the various forms, and in the case of wood-inhabiting species the kinds of wood they attack. The range of many species was extended by the study.

Change of pathogenicity shown by the "Bakanae" fungus, Gibberella fujikuroi, S. Shimada (*Sapporo Nat. Hist. Soc. Trans., 13 (1933), No. 1, pp. 6–8*).—This pathogen was isolated from rice in 1928. By December 1931 it had lost its ability to cause overgrowth and slenderness of rice seedlings. Virulence could not be restored by growing a 4-year- or 5-year-old strain on rice for 1 month.

Combating black leaf spot [trans. title], O. Nielsen (*Tidsskr. Planteavl, 39 (1933), No. 3, pp. 437–452, figs. 3; Eng. abs., pp. 451, 452*).—Black leaf spot or black mold (*Alternaria brassicae*) is the most injurious parasite in seed production of cruciferous plants in Denmark, attacks on cauliflower and white cabbage being especially severe. The fungus fouls the seed, diminishes the yield, and retards germination, but is of slight importance in the seed beds in Denmark.

Spraying with a 2 percent Bordeaux mixture to which 0.5 percent lead or calcium arsenate was added delayed maturity up to 10 days, but it increased the yield of seed up to 285 kg of dwarf sugar-loaf cabbage seed per hectare, besides increasing the size of the grain somewhat and the germination capacity 9 percent. Moreover, spraying decreased attacks of *Alternaria* on the seed 50 percent. In spraying, a motor sprayer of from 10 to 20 atmospheres' pressure is advisable, and no spreaders are then necessary. Dusting with Bordeaux dust was not efficacious.

Seed portions from the experiments were also disinfected with a Danish mercury compound, "Sanagran VIII", diluted with its double weight of inert material, 1 kg of seed being dusted with 5 g of the mixture. The germinating capacity of the seed was uninjured and attack by *Alternaria* diminished. Seed so treated and stored for one year showed undiminished germination capacity, but the seed were injured by more than the amounts prescribed.

An experiment in stripping the leaves showed promising results. When dead leaves and dead plants are removed in the spring from a wintered cabbage field, the germinating capacity of the seed is increased and the attack of *Alternaria* decreased.

The natural occurrence of crown gall on the giant cactus, Carnegiea gigantea, J. G. Brown and M. M. Evans (*Science, 78 (1933), No. 2017, pp. 167, 168*).—Galls on this cactus, thought to be of crown gall nature, have been known to the senior author in Arizona for at least 20 years, and descriptions of various types are given. Recently the authors cultured from some of these galls an organism apparently identical with the peach and cottonwood strains of *Phytomonas tumefaciens*. Since the giant cactus forests from which the material was obtained are removed from agricultural districts, the question is raised and discussed as to whether crown gall may not be indigenous to the Southwest.

Experiments in combating finger-and-toe disease (Plasmodiophora brassicae) [trans. title], N. J. Nielsen (*Tidsskr. Planteavl, 39 (1933), No. 3, pp. 361–400, figs. 4; Eng. abs., pp. 390, 391*).—Experiments in combating finger-and-toe disease made at the Danish State Experiment Station, Studsgaard, Jylland (Jutland), 1908–18, indicate that two factors are of importance in its control—lime application up to a suitable soil reaction and a sufficient lapse of time between crops of crucifers. If one of these factors is neglected the other becomes doubly important. Lime experiments made on slightly acid, loamy soil gave increasing yield for increasing lime applications up to 18,000 kg per hectare. This quantity, which gave the soil a slightly basic reaction, has as yet shown no ill effects on other crops in the rotation. It seems to make little difference whether lime is applied as burned lime or as carbonate, all at once or in several doses, or in the autumn or spring.

If a crop of crucifers is grown in a field every 6 or 8 years, it seems possible to avoid severe attacks. Growing crucifers every fourth year only, i.e., with three intervening noncruciferous crops, seems as a rule insufficient to check the disease.

In one experiment both infected and noninfected manure was tested. Swedes were grown in rotation every fourth year in soil which at the beginning was severely infected. The other experiments have shown that under these conditions ample opportunity is afforded for maintaining the infection unabated, so that it is quite understandable that applications of infected manure did not influence the attack. There seems to be a possibility that infection in the soil is maintained through cruciferous weeds. Apparently, however, there is no danger of spreading the disease through the seed.

A new copper spray, W. H. Martin (*N.J. Agr., 15 (1933), No. 3, p. 5*).—A new colloidal copper developed by the New Jersey Experiment Stations and tested for two years on peach and apple trees was found highly effective in controlling scab and fruit spot and caused no injury when used with summer oils. However, trials in wet seasons are desired before unqualified recommendations can be given.

Celery chlorosis, W. R. Robbins (*N.J. Agr., 15 (1933), No. 3, pp. 5, 6*).—Yellowing, characterized by a green pattern of the veins, was observed on certain muck soils in New Jersey and is ascribed to the high prevailing pH, 7.2 to 8, which renders iron unavailable to the plant. It is suggested that ammonium sulfate be used instead of nitrate of soda, and that aluminum sulfate or sulfur might be applied if necessary to reduce the alkaline condition.

Reaction of maize seedlings to Gibberella saubinetii, H. K. Hayes, I. J. Johnson, and E. C. Stakman (*Phytopathology, 23 (1933), No. 11, pp. 905–911*).—The manner of reaction of corn seedlings to attacks of *G. saubinetii* was determined at the Minnesota Experiment Station by inoculating seed with pure culture of the organism and planting the seed in sand in a greenhouse where the soil temperatures were controlled within a range of approximately 2° C., an average soil temperature of 15° being maintained. There was a sensible relation between the reaction of replicates when seedling progeny from the same ears were studied, indicating that the method was sufficiently accurate to be used as a means of isolating lines that might be consistently resistant or consistently susceptible.

"Interannual correlations, expressing the extent to which there was an inheritance of manner of reaction to *G. saubinetii*, were for the most part so small that it seems safe to conclude that the method is not reliable as a means of isolating lines that may be expected to behave in a consistent manner. In other words, the progenies of individual ears were relatively constant in the extent of seedling blight, although inheritance was not apparently the main cause of uniformity of reaction in different replicates."

Studies of the downy mildew (Sclerospora graminicola setariae-italicae) on Italian millet in Manchuria.—I, About the germination of oospores [trans. title], H. Takasugi and Y. Akaishi (*Res. Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 11 (1933), pp. 1–20, pls. 8; Eng. abs., p. 20*).—Field investigations in 15 Manchurian districts, 1927–29, showed a 10.25 percent damage caused by downy mildew. Experiments with oospore germination showed a viability period of over 8 years. When oospores were treated with fungicides of different concentrations in aqueous solution and subsequently examined for viability by germination tests, the following solutions were found effective: Tillantin, Uspulun, Semesan, corrosive sublimate, copper sulfate, and formalin, also the hot water treatment.

Field experiments showed that crop rotation and seed disinfection are effective preventives.

A disease of cultivated mushrooms caused by Verticillium malthousei sp. nov., W. M. Ware (*Ann. Bot.* [*London*], *47* (*1933*), *No. 188*, *pp. 763–785*, *pls. 2*, *figs. 6*).—A disease of cultivated mushrooms, noted in October 1929, is described. The most important symptoms are (1) deformity of the entire mushroom, which is covered with a white, or grayish-white, close mycelium; (2) the production of grayish-white spots on the pileus of mushrooms not deformed; or (3) the occurrence of white infected areas on stipe or gills.

Infection experiments which proved the parasitism of the fungus confirmed the suspicion that only inoculation at the earliest stage of growth causes the production of deformed mushrooms, while inoculation at later stages results in local infections such as the typical spotting of the pilei. The fungus is compared with others known to be parasitic on mushrooms, and it is considered identical with one which was incompletely described by G. T. Malthouse in 1901. The name *V. malthousei* n.sp. is proposed.

Control measures are suggested.

The Helminthosporium disease of oats (*West of Scot. Agr. Col., Res. Bul. 3* (*1933*), *pp. 74*, *pls. 23*, *figs. 8*).—The symptoms of a disease of oats caused by *H. avenae* and popularly known as "leaf stripe" are described and classified according to the season of occurrence as belonging to the primary phase on the seedling or the secondary phase on the mature plant. Most of the cases reported in Scotland of poor stands resulting from oat seed of high germinative capacity are attributed to this disease. Infection from the soil is regarded as playing no part in nature.

The mycelium, conidia, pycnidia (not hitherto recorded), sclerotia, resting mycelium, and perfect stage are described in detail. Perithecia have not been found in Scotland.

The influence of environmental conditions on the existence of the fungus is discussed, and it is shown that *H. avenae* grows well over a range of from pH 5 to 6.75. The optimum temperature is 20° C., and the maximum about 30°. The fungus was not injured by prolonged exposure to temperature below 0°. Growth was slightly checked in the presence of light. Spores did not germinate at lower atmospheric humidities than 96 percent. Humidity also largely controlled conidial infection of oat leaves. It was found that the primary phase of the disease is limited in the field largely by temperature, reaching a maximum on the leaves in the autumn and early spring. The intensity of the secondary phase and of infection of the grain was related to atmospheric humidity and was closely correlated with rainfall. The disease was found to be controlled by efficient disinfection of the seed.

A bibliography of 70 titles is appended.

Resistance of oat varieties to crown rust [trans. title], P. A. I͡ACHEVSKIĬ (JACZEVSKY) (*Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant Breeding*), *5. ser.*, *No. 1* (*1932*), *pp. 135–146*; *Eng. abs.*, *p. 146*).—The paper reports results of observations on oat crown rust (*Puccinia coronifera*) at two experiment stations in the Uralsk region (Russia) in 1928, when the rust infection was very severe. Of the varieties tested, the least affected was Verkhni͡achskiĭ, which, during the year, gave also the highest yield, although ordinarily it is a medium yielding variety. It is stated that the early oat sowings nearly escaped rust, while the latest sowings were affected very heavily and produced more vegetative growth but yielded the least.—(*Courtesy Biol. Abs.*)

Control of oat smut, V. H. YOUNG and C. K. MCCLELLAND (*Phytopathology, 23 (1933), No. 10, pp. 825–830*).—According to this contribution from the Arkansas Experiment Station, effective control of oat smut (*Ustilago avenae* and *U. levis*) on Fulghum oats at Fayetteville, Ark., resulted from the use of several organic mercury dusts, formaldehyde dust, and the ordinary liquid formaldehyde treatment. In 1931 excellent control also resulted from the use of 0.5 oz. of elemental iodine in 10 percent solution in carbon bisulfide per bushel of seed, but the results were not so favorable in 1932, possibly due to poor coverage with the iodine solution. The dusts which gave a high degree of control were Ceresan, Dubay No. 952 K, Dubay No. 500 LL, Dubay No. 952 C, Dubay No. 1,134, and Corona oat dust. These dusts compared favorably with the liquid formaldehyde treatment for oat smut control. Corona No. 174 E gave fair control, and Merko was ineffective.

None of the treatments used appeared to affect the stand or the ratio of straw to grain. Significant gains in yield resulted from the treatments in 1932.—(*Courtesy Biol. Abs.*)

Morphological characters and parasitism of various fusaria on the potato [trans. title], S. J. DU PLESSIS (*Ann. Univ. Stellenbosch, 11 (1933), A, No. 3, pp. 24, pls. 4; Eng. abs., p. 21*).—The wilt disease of potatoes occurring in the Union of South Africa is mostly caused by *Bacillus solanacearum* and occasionally by *Phytophthora infestans*. In some cases, however, various *Fusarium* species were found to be associated with the former organisms in affected material. Several *Fusarium* species also have been isolated from potato tubers affected with dry, wet, or stem-end rot. These species, namely, *F. bulbigenum blasticola*, *F. orthoceras*, *F. orthoceras albido-violaceum*, *F. oxysporum*, *F. oxysporum forma* 1, *F. coeruleum*, *F. solani*, *F. sambucinum*, and *F. argillaceum* are described in this contribution.

"By means of potato tuber inoculations it was established that the species belonging to the section Elegans were the most important rot producers, whereas those belonging to the sections Martiella, Discolor, and Ventricosum caused only a slight decay of potato tubers. The rots in the former cases varied from dry, caused by *F. oxysporum forma* 1, to watery and semiwatery caused by *F. bulbigenum blasticola*.

"No wilt of potato plants could be produced in the greenhouse by inoculations with any of these species. The plants from apparently unaffected tubers, selected from a consignment of which about 40 percent were rotted, remained perfectly healthy, though some of the planted tubers rotted in the soil before any germination could take place.

"These *Fusarium* species therefore appear to be of importance mainly as rot producers in the store or in the field."

Variations in the total nitrogen content of normal and leaf-roll potatoes, G. COCKERHAM (*Leeds Phil. and Lit. Soc. Proc., 2 (1933), No. 8, pp. 375–382, figs. 3*).—Very few citations are said to be given in the literature on the nitrogen contents of plants affected with leaf roll. Preliminary investigations consisting of three separate analyses were undertaken at the Scottish Plant Breeding Station, and the results indicate pronounced differences in the diurnal variations and the total nitrogen content of normal and leaf roll potatoes. This is considered as an interference with the normal metabolism of nitrogenous substances by the presence of the specific leaf roll virus.—(*Courtesy Biol. Abs.*)

Influence of spray applications on air temperatures surrounding sprayed potato plants, H. R. Rosen (*Phytopathology, 23 (1933), No. 11, pp. 912–916, fig. 1*).—This is a contribution from the Arkansas Experiment Station.

Instead of controlling tip and margin burn of Irish potato leaves, Bordeaux mixture 4–4–50 and similar formulas produced considerable spray injury in the warmer coastal plain section of Arkansas. In the northern, hilly section this spray produced no such injury and effectively controlled tip and margin burn. Various climatic factors were studied, indicating that the sprays in the warmer section in most instances resulted in abrupt precipitous drops in air temperatures surrounding sprayed plants and that the amount of drop varied, depending on the prevailing temperature, relative humidity, and wind velocity.

The question is raised as to whether such sharp fluctuations in air temperature may sufficiently influence the health of the affected organs to account for the spray injury in the warmer section.—(*Courtesy Biol. Abs.*)

Potato spraying, W. H. Martin (*N.J. Agr., 15 (1933), No. 5, p. 7*).—When 5–5–50 Bordeaux mixture was sprayed during five seasons at pressures of 150, 250, and 350 lb. every 10 days on potatoes with little early blight and no late blight but flea beetles and leafhoppers in abundance, results suggested that not over 250–300 lb. pressure would be necessary. Success in potato spraying is deemed largely a question of the use of sufficient material and the proper adjustment of the nozzles to furnish adequate protection to the plant.

Studies on the smuts of sorghums.—I, Germination of spores of the loose kernel smut (Sphacelotheca cruenta) of sorghum [trans. title], H. Takasugi and Y. Akaishi (*Res. Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 11 (1933), pp. 21–60, pls. 9; Eng. abs., p. 53*).—The authors' observations showed a 20 to 30 percent damage in Manchuria due to *S. cruenta*, *Sorosporium reilianum*, and *Sphacelotheca sorghi*. The present paper deals chiefly with the germinating power of spores of loose kernel smut (*S. cruenta*).

It was found that spores require about 17 days for complete maturity from the time the infected head breaks off from the leaf sheath. Spores kept in the laboratory maintained their viability for 4 years, but spores of infected heads kept on and in the soil (outdoors) did not survive the winter. The optimum temperature for spore germination was 25° C. No spores germinated at 12° or 43°.

Solutions of formalin, copper sulfate, Semesan, Uspulun, Tillantin, or lime-sulfur mixture were effective for control, as well as the hot water treatment.

The cane disease situation in Hawaii today, J. P. Martin (*Assoc. Hawaii. Sugar Technol. Rpts., 12 (1933), pp. 87–90*).—The author describes the general situation, with special reference to mosaic, eyespot, leaf scald, chlorotic streak, and crop improvement studies.

Downy mildew of tobacco on pepper, tomato, and eggplant, G. M. Armstrong and W. B. Albert (*Phytopathology, 23 (1933), No. 10, pp. 837–839*).—The appearance of a distinctly new disease of pepper, tomato, and eggplant since the recent introduction of *Peronospora hyoscyami* on tobacco; the close association of the diseased plants with infected tobacco plants; and the apparent morphological similarity of sporophores and spores seem to indicate that *P. hyoscyami* can attack these plants. Pepper plants have been infected with spores from tobacco on two occasions. Spore measurements from the four hosts are given. The paper is a contribution from the South Carolina Experiment Station.—(*Courtesy Biol. Abs.*)

Frogeye disease of tobacco, A. V. Hill (*Aust. Tobacco Invest. Pam. 2 (1933), pp. 20, figs. 7*).—Experiments at Mareeba, North Queensland, showed the disease caused by *Cercospora nicotianae* to be satisfactorily controlled by the use of clean soil and clean seed, the spraying of seedlings with a 2-2-40 Bordeaux mixture, efficient priming in the field, and by prompt harvesting.

The thermal death rate of tobacco-mosaic virus, W. C. Price (*Phytopathology, 23 (1933), No. 10, pp. 749–769, figs. 2*).—A quantitative study was made of the rate of inactivation of tobacco mosaic virus by heat, using the local lesion method for measuring virus concentration. Virus in undiluted juice of mosaic diseased tobacco plants was completely inactivated in 1 minute at 96° C., in 10 minutes at 93°, in 80 minutes at 90°, in 32 hours at 85°, in 12 days at 80°, and in 40 days at 75°. It was not completely inactivated when held for periods up to 70 days at 68°. Virus in juice of mosaic diseased plants diluted 1:20 with water was inactivated in 1 minute at 92°, in 10 minutes at 88°, in 70 minutes at 85°, in 13 hours at 80°, in 72 hours at 75°, and in 20 days at 68°.

Two curves summarizing the time-temperature relations are given in the paper. Inactivation of virus is a gradual process which goes on more rapidly at first than after partial inactivation has occurred. It is influenced by concentration of virus and concentration of solids in the dispersing medium.

Manufactured tobacco, a source of inoculum for mosaic in flue-cured tobacco, H. J. Busch and F. A. Wolf (*Phytopathology, 23 (1933), No. 10, pp. 839–841*).—Occasional samples of snuff and chewing tobacco, when employed as inoculum, were found to result in mosaic. This fact is deemed important in accounting for the incidence of mosaic on seedling tobacco plants in seed beds.—(*Courtesy Biol. Abs.*)

Effect of mosaic of flue-cured tobacco on yield and quality, F. A. Wolf and E. G. Moss (*Phytopathology, 23 (1933), No. 10, pp. 834–836*).—Mosaic reduces the yield and impairs the quality of flue-cured tobacco, as has been shown to be the case with Burley and Maryland tobaccos. The greatest injury occurs to plants which are infected or inoculated at the time of transplanting, and the least injury to plants inoculated at topping.—(*Courtesy Biol. Abs.*)

Roguing as a means of control of tobacco mosaic, F. A. Wolf (*Phytopathology, 23 (1933), No. 10, pp. 831–833*).—When mosaic-free tobacco seedlings are transplanted to fields which have borne a mosaic-affected crop during the preceding season, a small proportion of the plants are diseased by the time they have become established. The removal of these few mosaic plants served as a practical means of mosaic control.—(*Courtesy Biol. Abs.*)

Susceptibility to rust and resistance in different species of Triticum [trans. title], W. Straib (*Ztschr. Zücht., Reihe A, Pflanzenzücht., 18 (1933), No. 2-3, pp. 223–240*).—Fourteen physiological races of *Puccinia glumarum tritici*, one of them from Canada, were used in inoculating 290 varieties belonging to 11 species of *Triticum*. Each trial row of wheat came from 1 parent plant.

Degrees of susceptibility among the different varieties due to infection from the 14 races were not correlated with the phylogenetic relationships of the wheats, but rather were dependent on the races of rust. All species contained varieties showing high susceptibility or resistance, wholly, or in part. In crossing to obtain resistant varieties, attention must be paid to racial reactions of the parents used. Only 2 varieties (of common wheat) showed absolute immunity (no chlorotic flecking). In these 2 cases the wheats were of Chinese origin and this complete immunity was in evidence toward 13 of the 14 races, but complete susceptibility was shown toward the race from Canada.

Tables are given showing complete data.—(*Courtesy Biol. Abs.*)

A Phytophthora rot of watermelon, J. G. Brown and M. M. Evans (*Arizona Sta. Tech. Bul. 51 (1933), pp. 45–65, figs. 46*).—Iowa Belle watermelons growing under irrigation near Marana, Ariz., were found to be attacked by a fruit-rotting disease identified as *P. cactorum*, reported for the first time in Arizona. Appearing in October and not on the midsummer crop, the authors assume that climatic factors may be concerned in its development. A technical description is given of the fungus and of the symptoms on watermelon fruits. The results of inoculation experiments with various vegetables, fruits, and other plants are set forth. New features are described for the mechanism of fertilization and for sphaeroconidia, at least two kinds of which were observed in this watermelon *Phytophthora*.

Little-leaf or rosette of fruit trees.—II, Effect of zinc and other treatments, W. H. Chandler, D. R. Hoagland, and P. L. Hibbard (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 255–263, fig. 1*).—Further evidence (E.S.R., 68, p. 210) was secured by the California Experiment Station that zinc sulfate is effective in controlling little leaf or rosette, and that chemically pure ferrous sulfate is of no avail. Laboratory tests with various soils showed that they possessed different capacities for fixing zinc, and that clay, organic matter, and salts are important factors in the fixation process. The manner and time of application of zinc materials were found important; for example, concentrating the chemical and applying it near the roots increased the percentage available to the tree. High nitrogen conditions, such as found in old corrals, accentuated little-leaf injury. The insertion of zinc sulfate directly into the tree gave good results in little-leaf control but often injured the sapwood seriously. Spraying trees with zinc sulfate solution was of doubtful value. Studies of the underlying causes of little leaf seemed to suggest that toxic substances formed by certain chromogenic bacteria which require rather high soil temperatures for their best growth might be concerned, and that these toxic materials are precipitated by compounds of zinc, mercury, silver, and calcium.

A study of the sooty blotch disease of apples and the causal fungus Gloeodes pomigena, A. B. Groves (*Virginia Sta. Tech. Bul. 50 (1933), pp. 43, pls. 10, figs. 3*).—Isolants obtained from cultures of the fungus *G. pomigena*, although generally similar in appearance, exhibited unmistakable differences not only on the cultural medium but in their natural habitat on the host. Of approximately 180 isolations, many appeared nearly identical, but a critical study of the variable forms enabled the author to group them according to the form of the thalli, as follows: (1) Ramose or peniculate, (2) fuliginous, (3) punctate, and (4) rimate. The thalli varied sharply in size, in density of the subiculum, and in mycelial patterns, and in other ways.

No definite relationships could be demonstrated between the thallus types on the apple and differences between the isolants in culture beyond the fact that visibly different thalli yielded cultures which were also different, as shown by both morphological and physiological observations. The ability of the sooty blotch fungus to penetrate the cuticle and epidermis of the apple was demonstrated, indicating the active if not vigorous parasitic nature of the fungus.

Overwintering of Phytomonas pruni on peach, H. H. Thornberry and H. W. Anderson (*Phytopathology, 23 (1933), No. 10, pp. 787–801, figs. 6*).—In studies at the Illinois Experiment Station, *P. pruni*, the causal organism of bacterial spot of peach, was found during the early spring, March and April, in cankers on 1-year-old twigs and water sprouts. Isolations by the plate method and microscopical examinations of the diseased tissues of 265 specimens revealed the organism in every case. Isolations from cankers which had developed the previous spring and had survived throughout the winter months revealed the organism in one case from a total of 185 specimens. Primary foliage infections were found to originate immediately about young spring cankers. The foliage on susceptible trees which were pruned of their 1-year-old and 2-year-old twigs, thus removing the cankers, did not develop the disease when other unpruned trees became infected, but remained free of the disease until infection was general throughout the orchard.

Inoculation by needle pricks from a young agar culture of the organism into young peach twigs at byweekly intervals from November to June, inclusive, showed that the incubation period was prolonged to 86 and 157 days and that the organism in twig tissue was able to survive the winter conditions and produce typical cankers the following spring. The organism in culture withstood winter conditions. Its optimum, minimum, and maximum temperature for growth and its thermal death point were 25°, 7°, 38°, and 52° C., respectively.

It is suggested that during the fall the bacteria from diseased leaves infect young shoots and produce microscopically invisible lesions, which develop into the typical spring cankers during the first warm period of spring.—(*Courtesy Biol. Abs.*)

A factor in the varietal resistance of cranberries to the false-blossom disease, R. B. Wilcox and C. S. Beckwith (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 8, pp. 583–590, fig. 1*).—In this joint contribution from the U.S.D.A. Bureau of Plant Industry and the New Jersey Experiment Stations, the results are presented of a laboratory study upon the comparative susceptibility of five cranberry varieties to false blossom disease when caged with a definite number of the insect vector, the blunt-nosed leafhopper. Susceptibility of the varieties and their attractiveness to the vectors were observed to follow the same order, Howes and Centennial being almost equally attractive and susceptible, followed in order by Champion, Early Black, and McFarlin. The apparent resistance of certain varieties of cranberries to false blossom is therefore believed due, in part at least, to their unattractiveness to the insect vector.

[False blossom disease of the cranberry], C. S. Beckwith (*N.J. Agr., 15* (*1933*), *No. 2, p. 5*).—False blossom, an incurable virus disease spread by the blunt-nosed leafhopper, was controlled by the New Jersey Experiment Stations by a 12-hour reflow of the bog about June 15, supplemented by an application of kerosene to the surface of the water. In the absence of water, pyrethrum soap spray the last week in June was helpful.

A sulphur-deficiency disease of the tea bush, H. H. Storey and R. Leach (*Ann. Appl. Biol., 20* (*1933*), *No. 1, pp. 23–56, pls. 4; abs. in Tea Quart.* [*Tea Res. Inst. Ceylon*], *6* (*1933*), *No. 3, pp. 121–127*).—In recent years an obscure disease of the tea bush, to which the name yellows has been applied, has seriously handicapped tea production in Nyasaland. The history of the disease is reviewed, and recent experimental work is reported showing it to result from a deficit of sulfur in the plant relative to other organic constituents.

Records of citrus canker from herbarium specimens of the genus Citrus in England and the United States, H. S. Fawcett and A. E. Jenkins (*Phytopathology, 23* (*1933*), *No. 10, pp. 820–824, fig. 1*).—The occurrence of canker (*Pseudomonas citri*) on 12 herbarium specimens of *Citrus* examined in England and the United States is recorded. No new countries are added to the known range. A collection of *C. medica* from India in 1827–31 and of *C. aurantifolia* from Java in 1842–44, both exhibiting canker lesions, constitute the earliest known records of this disease.—(*Courtesy Biol. Abs.*)

Pecan rosette, a physiological disease apparently susceptible to treatment with zinc, A. H. Finch (*Amer. Soc. Hort. Sci. Proc., 29* (*1932*), *pp. 264–266*).—Finding no relation between pecan rosette and the soluble salt content or pH of the soil, the Arizona Experiment Station tested various chemicals, such as ferric chloride, iron sulfate, and zinc chloride, both by spraying and by insertion into the trunk as a liquid or dry. Striking and consistent effects were secured from zinc sulfate and zinc chloride. Commercial iron sulfate with an appreciable zinc content was also helpful, but chemically pure iron salts were without effect.

Analyses of the leaves, stems, and shoots of healthy and diseased trees showed a low zinc content in the affected foliage or in foliage of trees located in susceptible areas. An examination of the roots of a severely rosetted 7-year-old tree failed to show any abnormalities that might be associated with the disease.

The Dutch elm disease, R. P. White (*N.J. Agr., 15 (1933), No. 5, p. 1*).—A brief account is presented of the symptoms of the disease, its discovery and distribution in New Jersey, and measures undertaken for its control.

Log interceptions at Norfolk in relation to the entry of tree diseases, G. F. Gravatt and M. E. Fowler (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 17 (1933), No. 11, pp. 129–133, pls. 2, fig. 1*).—*Graphium ulmi*, the causal fungus of the Dutch elm disease, was isolated from logs and from certain *Scolytus* beetles found under the bark of elm logs. The opportunity for harmful fungi to enter the country in logs is indicated in the fact that logs were imported in 1931 from 40 different countries.

Known distribution of Dutch elm disease in the United States, N. E. Stevens (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 17 (1933), No. 11, pp. 132, 133, fig. 1*).—Information is presented on the distribution of the disease, with the statement that up to September 11 402 affected trees were found in New Jersey and New York.

Spread and severity of the Dutch elm disease in Europe, N. E. Stevens (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 17 (1933), No. 10, pp. 117, 118*).—Comments are presented on the distribution, rapid increase, and destructiveness of the disease in European countries.

[Diseases of the Calla], R. P. White (*N.J. Agr., 15 (1933), No. 2, pp. 3, 4*).—Corm treatment studies at the New Jersey Experiment Stations showed that root rot and soft rot of Calla may be controlled by soaking the corms for from 3 to 5 hours in either formaldehyde or mercuric bichloride solution. Germination was slightly retarded by the treatments.

Powdery mildew of crape myrtle caused by Erysiphe lagerstroemiae n.sp., E. West (*Phytopathology, 23 (1933), No. 10, pp. 814–819, figs. 2*).—Powdery mildew of crape myrtle is common in the Gulf States, but only in the imperfect stage. The perfect stage found once in Florida is described in this contribution from the Florida Experiment Station as a new species (*E. lagerstroemiae*). In the absence of perithecia, hibernation is effected in the dormant leaf buds of the host from which it emerges with the growth of the plant in the spring.

Commercial lime-sulfur 1–80 has proved effective in controlling the disease.—(*Courtesy Biol. Abs.*)

Control of gladiolus scab, L. E. Miles (*Phytopathology, 23 (1933), No. 10, pp. 802–813, figs. 2*).—In field tests conducted over a period of three years by the Mississippi Experiment Station Calogreen, a fluffy form of mercurous chloride, proved by far the most efficient material tested as a disinfectant agent against the scab organism on gladiolus corms. A 1:1,000 concentration of bichloride of mercury used as a 12-hour soak gave next best results. Semesan, an organic mercury product, was fairly efficient. Calochlor, a mixture of mercuric and mercurous chlorides, gave a fair degree of scab control, but delayed germination, retarded growth, and resulted in a considerable reduction in the crop of corms harvested.

There is apparently no difference in the response of any particular variety of gladiolus to the efficiency of any disinfectant used. Calogreen applied to the soil on land known to be infested proved efficient in reducing infection from soil-borne scab organisms. Bordeaux mixture was more efficient in preventing foliage infection than was copper-lime dust.

The phytoptosis of lilac [trans. title], J. SMOLÁK (*Sborn. Československ. Akad. Zeměděl.* (*Ann. Czechoslovak Acad. Agr.*), *8* (*1933*), *No. 1–2, pp. 39–50, figs. 11; Eng. abs., pp. 49, 50*).—A phytoptosis due to *Eriophyes lowi* and fairly widely spread in Czechoslovakia on lilac (*Syringa vulgaris*) has been studied by the author for several years. Several forms of lilac galls have been found, varying greatly in severity and depending not only on the age of the bush and duration of infection but also on the locality, climate, and soil.

Leaves developed from a bud only in part damaged by the mites remain deformed. The mites living between the leaves in the buds injure especially the epidermis and subepidermal tissues which afford them a nutritive layer. In the open air they crawl actively about the buds and are also carried by the wind.

Protection of lilacs against this disease is much neglected in Czechoslovakia, but cutting off and burning of the witches'-brooms during winter and later spraying of the bushes with sulfur preparations (e.g., solbar) before the buds open are highly recommended.

Leaf scorch of narcissus, D. B. CREAGER (*Phytopathology*, *23* (*1933*), *No. 10, pp. 770–786, figs. 8*).—In studies carried on cooperatively by the [New York] Cornell Experiment Station and the U.S.D.A. Bureau of Plant Industry, many varieties of narcissus grown commercially were found subject to the leaf scorch disease, which results in the death of the leaves from 4 to 8 weeks before they should normally die. The initial symptoms appear as yellowish, reddish, or brown lesions that soon develop necrotic areas at the tips of the first leaves. Later in the season numerous secondary lesions appear as reddish brown spots on leaves near the primary lesions. The disease is caused by the fungus *Stagonospora curtisii*. Pathogenicity has been proved by inoculation with mycelium and with spores. The fungus is pathogenic to amaryllis as well as narcissus.

Indications are that the fungus overwinters in or on the bulbs, and that this is the principal source of inoculum for the primary cycle of infection. The principal agent of spore dissemination in the field is water during rains. The fungus gains entrance directly through the cuticle and forms an intercellular mycelium. Numerous pycnidia are produced in necrotic areas of the lesions, arising by modification of the simple and compound meristogenous methods. Spores are exceedingly variable in size and septation. Under some conditions nearly all spores are small and unicellular, with bicellular ones occurring rarely, while under other conditions the majority are quadricellular.—(*Courtesy Biol. Abs.*)

Resistance of the current season's shoots of Pinus monticola to infection by Cronartium ribicola, H. G. LACHMUND (*Phytopathology*, *23* (*1933*), *No. 11, pp. 917–922, fig. 1*).—It was found that most of the needles of *P. monticola* are held for 4 years and some even longer. Total shoot growth and annual needle production normally increase yearly. Consequently, since *C. ribicola* infects the pines through the needles, the greatest proportion of the cankers resulting from a given year's infection should be expected to develop on the shoots formed that year. In actuality the proportion is relatively small. Tabulations of approximately 6,000 cankers from different infection years gave an average of only 10 percent upon the shoots formed in the infection year as compared with over 50 and 30 percent, respectively, on shoots 1 and 2 years older. The resistance apparently centers in the needles of the infection season's shoots.—(*Courtesy Biol. Abs.*)

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Chief of the Bureau of Biological Survey, 1933, P. G. Redington (*U.S. Dept. Agr., Bur. Biol. Survey Rpt., 1933, pp. 32*).—Work of the year in addition to that noted elsewhere in this issue is reported on biological investigations and food resources of migratory birds, forest wild-life research, Alaskan reindeer investigations, introduced musk oxen, field investigations of injurious birds, the food of the Texas armadillo and pocket gopher, cyclic losses in wild fauna and flora, fur-animal diseases, game-bird losses, the alarming shortage of fur animals, developments in fur farming, conditions in rabbit raising, muskrat investigations in natural habitat, control of bat roosts, rodent losses and baits, and coyote ranging and control.

Federal laws relating to wild life in Alaska (*U.S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 10* (*1933*), *pp. 12*).—The Federal laws dealing with wild life in Alaska are here presented (E.S.R., 67, p. 280).

Regulations relating to game, land fur animals, and birds in Alaska, 1933–34 (*U.S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 11* (*1933*), *pp. 32, fig. 1*).—This is a compilation of the regulations effective July 1, 1933 (E.S.R., 67, p. 280). A map showing the boundaries of fur districts, wild-life reservations, and headquarters of wardens of the Alaska Game Commission is included.

Game-management developments and needs, edited and arranged by T. G. Taylor and B. C. Pittman (*Utah Sta. Misc. Pub. 10* (*1933*), *pp. 52*).—Articles presented at the fish and game management meetings at Logan, Utah, on December 2 and 3, 1932, in connection with the first two-year course in game management are as follows: Fish-Cultural Methods, by W. Witney (pp. 3–5); Life Histories and Enviromental Needs of Native and of Introduced Fish, by F. J. Foster (pp. 5–9); Fish-Planting Investigations, by A. S. Hazzard (pp. 9–12); The Bear River Migratory Bird Refuge, by G. E. Mushbach (pp. 12–14); Biological Survey of the Bear River Migratory Bird Refuge, by B. Maguire (pp. 15–17); Report on Sage-Grouse Survey in Rich, Wasatch, and Boxelder Counties, by T. G. Taylor and L. Kay (pp. 17–22); Report on Sage-Grouse Survey with Reference to Parasites and Disease, by D. E. Madsen (pp. 22–24); A Brief Progress Report of Gambel-Quail Investigation, by S. M. Gorsuch (pp. 24–27); Adaptation of Marginal Lands to Game Production, by W. Peterson (pp. 27–30); The Future of the Beaver in Utah, by M. Anderson (pp. 30–32); Game-Management Problems of Utah National Parks, by T. C. Parker (pp. 32–34); Some Observations in Big-Game Studies, by O. J. Murie (pp. 34–38); Deer Management Studies on the Kaibab National Forest, by W. G. Mann (pp. 38–41); The Deer Situation in Utah, by R. L. Turpin (pp. 42, 43); The Elk Situation in Utah, by O. A. Olsen (pp. 43–45); The Economic Value of Fish and Game to the State and Community, by R. H. Rutledge (pp. 45–49); and Legislative Needs in the Interest of the State Fish and Game Department, by C. E. Huish (pp. 50, 51).

Pocket-gopher control, W. E. Crouch (*U.S. Dept. Agr., Farmers' Bul. 1709* (*1933*), *pp. II+21, figs. 17*).—Following an introduction, this account deals with control in relation to habits, methods of control, and community effort in control. The practices recommended are said to be based on studies of the varying habits of pocket gophers and of environmental conditions and to be applicable wherever these rodents are found.

Report of the Chief of the Bureau of Entomology, 1933, C. L. Marlatt (*U.S. Dept. Agr., Bur. Ent. Rpt., 1933, pp. 47*).—Findings in work with fruit and shade-tree insects are noted as to control measures for the codling moth, relation of woolly apple aphid to perennial-canker disease of apple, the plum curculio, oriental fruit moth, peach borer, San Jose scale, the pecan nut casebearer, black pecan aphid, pecan phylloxera (*Phylloxera devastatrix* Perg.). obscure scale, American plum borer (*Euzophera semifuneralis* Walk.), pecan weevil, grape berry moth, the blueberry maggot, citrus rust mite, California red scale, citrus thrips, red date scale, date mite (*Paratetranychus heteronychus* Ew.), camphor scale, a mealybug attacking figs, and the Mexican fruit fly and other fruit flies.

An account of the work with the Japanese and Asiatic beetles follows.

The findings in work with cereal and forage insects are taken up under the headings of grasshoppers, the Mormon cricket, European corn borer, Hessian fly, sugarcane borer, the pea aphid on alfalfa, the alfalfa weevil, range caterpillar, chinch bug, white grubs, bean leafhopper, and the clover-pollinating bees of the Pacific Northwest.

Investigations of truck crop and garden insects are considered as to wireworms, the Mexican bean beetle, potato leafhopper, lima bean pod borer, the beet leafhopper, tobacco hornworm, raspberry fruit worm, red berry mites (*Eriophyes essigi* Hass.), strawberry root aphid, pepper weevil, greenhouse leaf tier, mole cricket, sweetpotato weevil, cabbage worms, the broad mite (*Tarsonemus latus* Banks) and the cyclamen mite, the gladiolus thrips (*Taeniothrips gladioli* M. & S.), the narcissus bulb fly, and mushroom insects.

Work with insects attacking cotton plants is dealt with under the headings of bollweevil, Thurberia weevil, bollworm, cotton flea hopper, and pink bollworm.

Work with insects affecting forests considered includes that relating to the western bark beetles, western pine beetle, mountain pine beetle, southern pine beetle, locust borer, liberation and recoveries of gypsy moth parasites, gypsy moth attractants, and insecticides. Insects affecting stored products dealt with are the pea weevil, bean weevils, raisin moth (*Ephestia figulilella* Greg.), confused flour beetle and rust-red flour beetle, grain insects, and those affecting cured tobacco, the household, and wood. Insects affecting man and animals are considered under the headings of screw worm and other blowflies, eye gnats, mosquitoes, sand flies, buffalo gnats, cattle grubs, horse bots, the use of blowfly maggots in surgery, rat mites in relation to typhus fever, ticks, and the development of fly-spraying machines. Under bee culture the diseases of bees and economic, technical, and colony behavior studies are considered. The report concludes with a reference to the identification and classification of various insects.

[Notes on economic insects and insecticides] (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1171–1179, fig. 1*).—The contributions presented are as follows: Pyrethrum Solutions for Determining Insect Infestations on Golf Greens, by R. Hutson (p. 1171); Long-Tailed Mealybug Abundant on Citrus, by D. W. Clancy (p. 1171); The European Corn Borer in Egypt, by A. H. Rosenfeld (pp. 1171, 1172); Otiorhynchids Oviposit between Paper, by G. N. Wolcott (pp. 1172, 1173); Notes on Potato Insects in Iowa, by H. D. Tate (p. 1173); On the Probable Reason for the Scarcity of the Southern Corn Stalk Borer (*Diatraea crambidoides* Grote) in Southeastern Georgia (p. 1174) and Insects Attacking *Solanum sisymbriifolium* in Eastern Georgia (pp. 1174, 1175), both by G. W. Barber; A Flotation Method for Determining Abundance of Potato Flea Beetle Larvae, by L. B. Daniels (pp. 1175–1177); Winter Mortality of the Camphor Scale and the Dictyosperma Scale [*Chrysomphalus dictyospermi* (Morg.)] in 1933 at New Orleans, La., by A. W. Cressman and L. T. Kessels (pp. 1177–1179).

Common names of insects approved for general use by American economic entomologists (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1169, 1170*).—Twenty-eight common names are added to those previously accepted by the

American economic entomologists (E.S.R., 66, p. 646), including the addition of one change from a name previously adopted (Mexican fruit fly for the orange maggot) and one additional name for *Diabrotica duodecimpunctata* Fab. (southern corn rootworm).

A method for temporary inhibition of coagulation in the blood of insects, W. E. Shull and P. L. Rice (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1083–1089*).—The authors found in studies at the Idaho Experiment Station that any desired degree of inhibition of coagulation in the blood of the cockroach may be obtained by treating the German cockroach and the oriental cockroach with acetic acid vapors when the time of exposure and temperature are controlled. The apparatus and technic employed in subjecting the cockroaches to acetic acid vapor, together with some data obtained by the use of this method, are presented.

Insect tolerance, R. L. Webster (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1016–1021, fig. 1*).—Contributing from the Washington College Experiment Station, reference is made to previous studies on the subject of resistance to insecticides with special reference to the San Jose scale, the California red scale, the black scale, and to resistant strains of codling moth, presented in connection with a list of 9 references to the literature.

In work at the field laboratory at Wenatchee apples were sprayed with the oil-lead arsenate combination, and a uniform deposit of between 60 and 65 μg of arsenic per square inch of apple surface was obtained. In 1930 an average control of 73 percent was obtained; in 1931, 60 percent; and in 1932, 36 percent.

The amount of soil brought by insects to the surface of a watered and an unwatered plot, H. R. Bryson (*Jour. Kans. Ent. Soc., 6 (1933), No. 3, pp. 81–90*).—In the course of a study of burrowing insects made at the Kansas Experiment Station during four seasons, 1927–30, upon a watered and an unwatered plat, it was found that their activities were greatly influenced by the environmental factors present at the time the burrowing was done. "The period of greatest activity each year was found to extend from July 15 to August 16 on both the watered and unwatered plats. Observations indicated that burrowing activities were greatest on the watered plat when the air temperatures were highest, and on the unwatered one when air temperatures were lowest. There was a sudden increase in burrowing activities on both plats following a period of unfavorable weather. Regular rains followed by temperatures ranging from 90° to 100° F. stimulated burrowing. Burrowing ceased materially when the maximum daily temperatures fell below 80° or approached 113°."

Insects collected in flight traps in the vicinity of Moscow, Idaho, P. L. Rice (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1079–1083, pl. 1*).—In flight traps operated by the Idaho Experiment Station in different types of localities near Moscow, the insects caught during the warmer months of 1930 and 1931 were determined by specialists. Data on the occurrence and flight habits of approximately 500 species were obtained, of which two fifths were Coleoptera and one fifth Hymenoptera.

Insect pests of stone fruits in Michigan, R. Hutson (*Michigan Sta. Spec. Bul. 244 (1933), pp. 40, figs. 38*).—This is a practical summary of information on the important enemies of the cherry, plum, and peach in Michigan.

Insect parasites of citrus in Central America, M. Bates (*Fla. Ent., 17 (1933), Nos. 2, pp. 29–32; 3, pp. 45–47*).—A brief report of observations made by the author while employed in Guatemala, Honduras, and El Salvador.

[Control work with economic insects by the Bureau of Plant Quarantine] (*U.S. Dept. Agr., Bur. Plant Quar. Rpt., 1933, pp. 1–31, 65*).—The work of the year here reported deals with the gypsy moth and brown-tail moth, satin moth, European corn borer, Japanese beetle, pink bollworm, Thurberia weevil, Mexican fruit fly and other species of *Anastrepha*, the Parlatoria date scale, and bulb flies and eelworms infesting narcissus. Reference is also made to a new form of cottonseed sterilizer for destroying pink bollworm larvae in cottonseed and adapted to continuous operation in handling the seed as it comes through the gin, a method of installing thermograph bulbs in cottonseed sterilizers, a method for treating hardy perennial plants in pots with lead arsenate, and a treating tank designed for applying the hot water treatment to bulbs.

[Insecticide investigations] (*U.S. Dept. Agr., Bur. Chem. and Soils Rpt., 1933, pp. 26–29*).—Data are reported as to toxicity of rotenone and croton, synthesis of rotenone, rotenone in an eastern weed (*Cracca virginiana*) (E.S.R., 69, p. 551), nicotine, synthetic organic insecticides, spray residues, fluoride residues on fruit, fumigants, arsenicals, and oil emulsions.

Efficient agitation in the spray tank, A. D. Borden (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1106–1108, fig. 1*).—The author found in the course of tests of more than 200 spray outfits that the agitation in the spray tank was decidedly inefficient. The propeller type agitators did not give a uniform mixture at speeds less than 200 r.p.m. A new type square end agitator is said to give excellent results at speeds from 88 to 110 r.p.m. and a low horsepower consumption.

Airplane liquid spraying, F. B. Herbert (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1052–1056, pls. 4*).—Reporting upon the latest method of applying liquid sprays by airplane, the author discusses types of insecticides and fungicides used, methods of applying, speed, results, advantages, etc.

Fruit injury on apples following nicotine tannate sprays, B. F. Driggers (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1137–1139*).—Contributing from the New Jersey Experiment Stations, the author reports that "a peculiar type of fruit injury following the use of nicotine tannate on apples was not duplicated when three varieties of apples were sprayed with nicotine tannate four times during July and August. Observations indicate that the injury occurs when the fruit is young and relatively easily injured. Evidence points to the presence of tannic acid as being responsible for the injury, and that an excess of free nicotine in the early cover sprays will reduce the amount of injury."

Tar distillate emulsions for the control of the rosy aphid and other fruit insects, F. Z. Hartzell and P. J. Parrott (*New York State Sta. Bul. 636 (1933), pp. 29*).—Experiments with tar distillate sprays, of which refined creosote oil rendered miscible in water by various emulsifying agents is the principal constituent, are reported. The work was undertaken with a view to securing information relative to their efficiency, particularly against various aphids and scale insects, the eyespotted bud moth, and certain associated species, the effect of such treatment on the vigor and production of the fruit trees being taken into consideration. It extended over a period of five years and a high degree of efficiency was demonstrated, notably against the rosy apple aphid, the black cherry aphid, and the eyespotted bud moth. When applied under the conditions specified, there was no indication of harmful effects on buds or wood. It appears that with these three pests the new spray materials should serve a useful purpose for many orchardists.

"To avoid risk of injury to trees, particularly the buds, treatment is restricted to the period in the spring when buds are dormant. The limitation of applications to such a brief period may entail greater difficulties for the New York fruit grower than for those in other fruit-growing areas. The actual number of days associated with dormancy of buds when temperature and soil conditions are suitable for spray operations and when there is freedom from high winds and rains are, generally speaking, rather few. In New York, it not infrequently happens that with the cessation of hard winter weather temperatures may rise rapidly, suggesting summer conditions, and as a result the buds develop quickly. Careful planning will be required to utilize days that present optimum conditions for the treatment of the trees."

Studies of contact insecticides, VI, W. C. O'Kane, G. L. Walker, H. G. Guy, and O. J. Smith (*New Hampshire Sta. Tech. Bul. 54 (1933), pp. 23, figs. 4*).—Two contributions are here presented, continuing previous work (E.S.R., 68, p. 215).

The first (pp. 4–20) deals with the reactions of certain insects to controlled applications of various concentrated chemicals. An application of minute droplets of an extract of pyrethrum flowers containing 15 percent of pyrethrins gave marked toxic effects on the larva of the yellow meal worm, as did 95 percent nicotine. "The antennae were sensitive to applications of these chemicals. Setae on the head gave reactions. Of thoracic appendages the coxa gave greatest reaction. Effects diminished toward the tip of the leg. Intersegmental areas of the thorax were definitely sensitive. Setae of the thorax gave definite reactions. Sensitivity of abdominal regions was less than that of thorax. There was a downward gradient in sensitivity from the first to the last abdominal segment, but not including the last.

"In further tests the chemicals included 95 percent nicotine, coconut oil fatty acid, white oil, and kerosene. In this series droplets of the chemicals were applied to the mouth parts, to spiracles, and to the anal opening, as well as to the regions of the body. Applications to the mouth parts or spiracles or anal opening did not always give maximum reaction. In all cases applications to the ventral transverse membranes, promesothorax, mesometathorax, and metathorax-abdomen, gave reactions of marked intensity.

"In a further series additional species of insects were used, including the American roach [American cockroach] (*Periplaneta americana* L.), the oriental roach (*Blattella orientalis* L.), and the croton bug [German cockroach] (*B. germanica* L.). Chemicals used included a pyrethrum extract containing 15 percent pyrethrins and C.P. nicotine (100 percent). Applications to the dorsal cervical region gave marked reactions, and the same was true of applications to the ventral cervical membrane. The antennae were definitely sensitive, especially in certain regions. Applications to mouth parts gave early reaction. Applications to regions of the thorax where sclerites are lacking gave greater reaction than applications to regions where sclerites are present. The regions of the abdomen showing sclerotic degeneration gave greater response than regions more fully sclerotized. Nicotine in many instances caused marked distention. Heart action was profoundly influenced by applications."

The second contribution deals with a new technic for initial appraisal of proposed contact insecticides (pp. 20–23). In this work a tentative new technic was set up for initial exploration of chemical compounds that might serve as new contact insecticides. "The time elapsing until the onset of convulsions is given a valuation, decreasing as the length of time increases. Study of a series of 45 organic compounds by this method gave interesting and important results. Sixteen of the 45 gave marked reactions. The same 45 compounds were diluted and sprayed on aphids in the accustomed way. Tested in this manner only 4 of the 45 gave interesting results. These 4 were included in the 16 which showed definite toxicity by the new method. The 16 substances which gave marked results by the new method were then studied further as to alterations in methods of dilution or other measures to improve physical character of the diluted spray, and in all cases performance after these various changes was definitely improved, sometimes in marked degree."

Detection and determination of surface oil on citrus following spraying, A. F. Swain and D. Green (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1021–1030, pl. 1, figs. 2*).—The authors consider the factors involved in the study of oil spray application and review the methods available for such study. Two new technics are presented; one for the determination of extent of coverage by the use of an adherent powder, the other for the determination of surface oil films by means of a solvent wash. Illustrations of the range of application of the two technics are given.

Study of auxiliary gases for increasing the toxicity of hydrocyanic gas.—Part I, Studies with ladybird beetles as indices of toxicity, F. S. Pratt, A. F. Swain, and D. N. Eldred (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1031–1041, pl. 1, figs. 2*).—In the studies here reported, which were conducted at El Monte, Calif., almost 200 chemicals covering a wide range of organic and inorganic compounds were used in qualitative and toxicity tests for the purpose of determining their action on lady beetles in conjunction with hydrocyanic acid gas.

"It was found that several were toxic in themselves, but few approached hydrocyanic acid gas in degree of toxicity. Some were very irritating to the insects, and some were stupefying. In general it was found that those compounds whose vapors were effective in increasing the toxicity of hydrocyanic acid gas were either predominantly toxic or moderately toxic and irritating. The majority of compounds having value fell in the latter class. Certain of the gases which stupefied the insects actually decreased the toxic action of hydrocyanic acid gas. The vast bulk of the compounds had apparently no effect, neither increasing nor decreasing the toxicity of hydrocyanic acid gas."

Household insecticides (*U.S. Dept. Agr., Food and Drug Admin. Rpt., 1933, p. 17*).—Reference is made to several moth preparations and fly sprays examined during the year.

Western willow tingid, Corythucha salicata Gibson, in Oregon, B. G. Thompson and K. L. Wong (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1090–1095, fig. 1*).—Contributing from the Oregon Experiment Station, the authors report upon *C. salicata*, its distribution on apples in Oregon, and control measures. The overwintering adults were found quite difficult to kill with the sprays tested, although the nymphs were readily destroyed by most of the insecticides used. Pyrethrum extracts, nicotine sulfate 40 percent, oil emulsions, and whale-oil soaps were tested alone and in combination.

Relative importance of species of grasshoppers in northwestern Arkansas, W. R. Horsfall, A. W. Dowell, and C. E. Palm (*Jour. Kans. Ent. Soc., 6 (1933), No. 3, pp. 98–104*).—In a comparative study of the importance of grasshoppers in Washington County, Ark., it was found that the red-legged grasshopper made up over 50 percent of the grasshopper population and was most important in clover and alfalfa. *Melanoplus bispinosus* Scud. was the dominant species in dry upland pastures and in pastures of Bermuda grass. The differential grasshopper, although not numerically as important as a number of other species, seemed to do the most damage to succulent crops. *M. mexicanus* Riley was relatively unimportant during the years when the collections were made. The American grasshopper and *Schistocerca obscura* Fab. were very abundant and destructive locally and must be included among the species of economic importance. Most of the destructive species of grasshoppers appear as adults after the middle of July, so that damage by grasshoppers occurs in late summer or early fall.

Notes on the biology and control of the red locust in Southern Rhodesia, 1932–1933, I, II (*Rhodesia Agr. Jour., 30 (1933), No. 10, pp. 791–837, pls. 2, fig. 1*).—In part 1 control of locusts is dealt with by R. W. Jack (pp. 791–814), and in part 2 biological notes on the red locust (*Nomadacris septemfasciata* Serv.) are given by M. C. Mossop (pp. 815–837).

The mechanism of absorption of sodium fluoride by roaches, G. L. Hockenyos (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1162–1169*).—In this contribution a technic is described whereby individuals of both the American cockroach and the oriental cockroach are strait-jacketed and the fluoride applied to various parts of the body. "The data so obtained [are] supplemented by dipping tests. The evidence all indicates that sodium fluoride can be absorbed directly through the body integument of the insect, especially through the membranous areas of the body wall, such as the junction of the head and thorax and also the region of the coxae. The large area of absorption necessary to take up enough fluoride to kill the insect would indicate that in actual practice the roach must absorb some of the toxic material by licking it off the body appendages."

Two new species of Plectrothrips, J. R. Watson (*Fla. Ent., 17 (1933), Nos. 1, pp. 16–18, figs. 4; 2, pp. 33, 34*).—Contributing from the Florida Experiment Station, *P. montanus* and *P. bruneri* are described as new.

The identity of two Lygus pests (Hemiptera, Miridae), W. E. Shull (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1076–1079*).—Contributing from the Idaho Experiment Station, the author points out that the scientific and common names of the insects *L. elisus* Van D. and *L. hesperus* Knight have been confused. These forms are known to be distinct species and are raised from the rank of variety to that of species. Differences between the two forms are discussed and new common names proposed.

Cicadellidae leafhoppers of New Hampshire, P. R. Lowry (*Ohio Jour. Sci., 33 (1933), No. 1, pp. 59–80; also New Hampshire Sta. Sci. Contrib. 40 (1933), pp. 59–80*).—Studies of leafhoppers of New Hampshire, based upon collections in large part by the late author in 1921 to 1927 and carried on until the work was interrupted by his death in April 1931, have been edited by H. Osborn and D. M. DeLong. The work is presented under the heading of the Cicadellidae of certain plant associations in New Hampshire, including salt marsh, bog, white pine-hemlock forest, and dry sandy uplands, none of which areas is over 2.5 miles from tidewater or over 100 feet above sea level. The records of collections, including localities and dates, are presented in detail (pp. 65–80).

Lizards as predators of the beet leafhopper, G. F. Knowlton and M. J. Janes (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1011–1016*).—This is a contribution from the Utah Experiment Station in cooperation with the U.S.D.A. Bureau of Entomology based upon investigations preliminary accounts of which have been noted (E.S.R., 67, p. 568; 68, p. 778).

During the preceding 3 years, 2,659 lizards were collected and their stomachs examined. Of 1,573 *Uta stansburiana stansburiana* and 213 *Sceloporus graciosus* taken among host plants of the beet leafhopper, 915 and 59 stomachs, respectively, contained a total of 9,322 and 239 specimens of the beet leafhopper. Other lizard species in which 1 or more specimens of the beet leafhopper were found include *S. elongatus*, *Phrynosoma douglassii ornatissimum*, *P. platyrhinos*, and *Eumeces skiltonianus*.

The resistance of leaves of red clover to puncturing, H. H. Jewett (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1135–1137, fig. 1*).—In work at the Kentucky Experiment Station (E.S.R., 68, p. 354), leaves of a Kentucky red clover (known as No. 101) and an Italian red clover were tested as to resistance to needle puncturing. "It was found from puncturing 500 leaves of each clover that the Kentucky clover offered greater resistance to puncturing than the Italian clover. The Kentucky clover is more resistant to leafhopper injury than the Italian clover. Since the insect feeds by puncturing plant tissue, it is thought that this greater resistance to leafhopper injury is due, in part at least, to greater resistance to puncturing."

Burning for the control of aphids on alfalfa in the Antelope Valley of California, R. A. Blanchard, H. B. Walker, and O. K. Hedden (*U.S. Dept. Agr. Circ. 287 (1933), pp. 24, figs. 12*).—This is an account of work conducted in cooperation with the California Experiment Station from 1926 to 1931 in the Antelope Valley and other districts in southern California, where, since 1924, the pea aphid has caused considerable damage to alfalfa. The cowpea aphid has also at times become numerous on alfalfa in this district, but not sufficiently to cause economic losses. The feeding of the pea aphid checks the growth of the alfalfa, and as the population increases and the feeding is prolonged plants in the more heavily infested areas become yellow, until finally the whole field may become brown and the plants desiccated. Burning over in the spring has been the only remedy known to be applied to infested fields. This led to experimental work with various types of burners, the results of which are reported.

The spraying of oil on the aphid-infested alfalfa, followed by ignition, did not give satisfactory control. A single burning with a tractor-drawn burner of the mechanical atomizing type proved efficient if the burning was done between March 12 and April 1. With a horse-drawn burner of the generative type two burnings were required to accomplish the same result.

The approximate cost of the burning machine of atomizing type was $1,400, of the generative type $300. The estimated cost of burning per acre was $5.08 and $5.02, respectively. The fuels used ranged from Diesel oils of 27° B. to distillates of 39° costing from 5 to 9 c. per gallon. Burning, as done by these machines and under the conditions stated, caused no observable injury to alfalfa. The alfalfa on burned areas grew more rapidly and was more leafy than on unburned areas. The practical use of burners was found to depend on the age and vigor of the alfalfa stand, the weather, and the price of hay.

Predatory and other insects were largely destroyed by burning except in very warm weather or where protected by debris or soil. Heavy reinfestations of weeds occurred in some fields the year following burning.

Additions to the aphid fauna of Florida, A. N. Tissot (*Fla. Ent., 17 (1933), No. 3, pp. 37–45, figs. 25*).—In this contribution from the Florida Experiment Station two species of aphids which appear to be new to science are described, namely, *Rhopalosiphum gnaphalii* and *Amphorophora crataegi*, the former taken from nutgrass (*Cyperus esculentus*) and *Gnaphalium* sp. at Plant City, Fla., and the latter from *Crataegus uniflora* at Gainesville, Fla. Descriptions of the sexual forms and of the apterous viviparous female of another species of which only the alate viviparous female has heretofore been known are included.

Studies of the "resistant" California red scale Aonidiella aurantii Mask. in California, W. Moore (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1140–1161, figs. 3*).—This is a report of a preliminary study that has been made of the "resistant" red scale of California (the orange scale). This includes the influence on the kill of the type of hydrocyanic acid concentration, the stage of development of the insect, the temperature of the host, the temperature and relative humidity preceding, during, and after the fumigation, and protective stupefaction. It was found that the type of concentration and the percentage of insects in the resistant stages did not determine the effectiveness of the fumigation. Temperature and relative humidity had a decided influence. Protective stupefaction may or may not be an important factor.

The account is presented in connection with a list of 12 references to the literature.

Progress report of experiments on the control of cabbage worms (*U.S. Dept. Agr., Bur. Ent., 1933, pp. 14*).—This is a report, prepared by P. N. Annand and C. A. Weigel, of a preliminary series of experiments commenced in the fall of 1932 with a view to determining the value of insecticides which do not leave injurious residues in the control of various species of cabbage worms. Experiments conducted in Chadbourn, N.C., Charleston, S.C., Baton Rouge, La., and Columbus, Ohio, are summarized, many of the details being presented in tabular form. It is pointed out that the results obtained do not justify the making of general recommendations.

The influence of light and temperature on certain characters of the silkworm (Bombyx mori), M. Koguré (*Jour. Dept. Agr., Kyushu Imp. Univ., 4 (1933), No. 1, pp. 93, figs. 2*).—This report of experimental work, part 1 of which deals with the influence on hibernation and egg color (pp. 3–68) and part 2 with the influence on the number of molts (pp. 68–89), includes a bibliography of four pages.

Investigations regarding blue grass webworms in turf, H. F. A. North and G. A. Thompson, Jr. (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1117–1125*).—This is a report of work conducted by the Rhode Island Experiment Station and the State Department of Agriculture cooperatively during the years 1930–32, in which a number of insecticides were tested on webworm infested putting green plats. The species of importance was found to be the bluegrass webworm *Crambus teterrellus*. Velvet bent (*Agrostis canina*) was found to be damaged more heavily during 1931 and 1932 than the other species of bentgrass, and, similarly, some of the varieties of velvet bent were damaged more heavily than others.

"The damage was reduced considerably by the use of arsenate of lead, paris green, or a trade brown patch remedy and soil insecticide; reduced moderately by flooding with dilute pyrethrum extracts and an extract of rotenone; and only reduced slightly by the use of kerosene emulsion. Arsenate of lead 2 lb. in 20 gal. of water per 1,000 sq. ft. of turf is regarded as a very promising remedy."

Sugar-cane moth borer (Diatraea) investigations: Outline of work done in Antigua during the year 1931, H. E. Box (*Antigua, B.W.I.: Colon. Devlpmt. Fund, 1933, pp. 10*).—This is a report of a study made of the sugarcane moth borers of the genus *Diatraea* in 1931 and their parasitism by *Trichogramma*, preliminary to the work of the following year noted below.

Sugar-cane moth borer (Diatraea) investigations: Outline of work done in Antigua and St. Kitts during the year 1932, H. E. Box (*Antigua, B.W.I.: Colon. Devlpmt. Fund, 1933, pp. [2]+40, pl. 1*).—A detailed account is given of the work of the year in Antigua and St. Kitts, including work with the *Trichogramma* egg parasite, experiments with European parasites of the corn borer against *Diatraea* in Antigua (particularly biological control of the sugarcane borer), and the introduction and establishment of the Cuban tachinid parasite *Lixophaga diatraeae* Towns.

Report on entomological section, R. W. E. Tucker (*Agr. Jour. [Barbados], 2 (1933), No. 1–2, pp. 32–39, pl. 1*).—This brief report (E.S.R., 69, p. 548) deals particularly with control work with the sugarcane borer and the value of the egg parasite *Trichogramma minutum*. The growing control of this borer through increased liberations of the egg parasite, commenced in 1929 (E.S.R., 62, p. 545; 64, pp. 361, 749; 67, p. 154), is said to have been fully apparent in the crop reaped in 1933. The average infestation of cane joints, taking standard varieties at 12 factories, was 27.3 percent in 1931, 17.4 in 1932, and 14.5 percent in 1933. Prior to 1931 the average infestation was over 30 percent. The introduction of the dipterous parasite *Lixophaga diatraeae* from Cuba to supplement the mass distribution of *T. minutum* failed, but its reintroduction and mass rearing and distribution will be attempted in 1934.

Field studies with pine oils as destroyers of overwintering codling moth larvae, F. M. THOMPSON, JR., and H. N. WORTHLEY (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1112–1117, pl. 1*).—This is a contribution from the New Jersey Experiment Stations reporting the results of work conducted in cooperation with the Pennsylvania Experiment Station.

"A blend of various fractions of steam-distilled pine oils was found to be effective in field applications against hibernating codling moth larvae (*Carpocapsa pomonella*) when brushed liberally upon the rough bark, crotches, pruning wounds, and cankers of apple trees. The applications produced marked reduction in the amount of first brood codling moth injury in the treated blocks without injury to the trees. Fruit counts at harvest indicated that the initial advantage gained by the treatment will produce the greatest benefit when large areas are treated at the same time and followed by the recommended codling moth cover sprays."

[Codling moth control work], T. J. HEADLEE (*N.J. Agr., 15 (1933), No. 2, pp. 4, 5*).—A brief statement is made of the progress of work with insecticides to be used as substitutes for lead arsenate in control of the codling moth. Particular mention is made of work with nicotine tannate, an account of which by Driggers is noted on page 501.

Biological control of the oriental fruit moth, D. M. DANIEL, J. COX, and A. CRAWFORD (*New York State Sta. Bul. 635 (1933), pp. 27, figs. 11*).—This contribution reports upon the value of the parasites of the oriental fruit moth, which by the end of 1931 had infested practically all of the commercial peach area of western New York. In addition to the peach, considerable injury has been caused to apples, and quinces were 100 percent infested. Since the establishment of the parasite *Macrocentrus ancylivorus* there has been a decided improvement in the situation, this parasite having taken a toll of twig-infesting larvae steadily increasing from 6.63 percent in 1928 to 25 in 1932.

"Parasitism by indigenous species varied considerably from year to year, due chiefly to fluctuations in the abundance of *Cremastus minor* and *Glypta rufiscutellaris*. Coincident with the increasing parasitism by *M. ancylivorus*, there was apparently a decrease in the population level of the fruit moth. In Niagara County the high point of damage was reached in 1929, when 59.89 percent of the crop was infested, with an estimated population of 18,901 larvae per acre. In 1932 these estimates showed only 8,288 larvae per acre, with 14.01 percent of the crop infested. This represents a reduction of 56.4 percent in the population per acre. It is believed that similar results may become apparent in the other infested counties when the parasites become firmly established."

An account of the technic developed for the rearing of both hosts and parasites is included.

Subfreezing temperatures lethal to the European corn borer infesting green ears of sweet corn, C. H. BATCHELDER and D. D. QUESTEL (*U.S. Dept. Agr., Tech. Bul. 395 (1933), pp. 14, figs. 6*).—In studies of the effect of subfreezing temperatures on the European corn borer infesting green ears of sweet corn, commercial refrigeration laboratories and cold storage houses in eastern New England were made use of.

"When exposed, unprotected, in still air, the following exposures were found to be lethal to fifth-instar larvae: 10 minutes at —25° F., 12½ minutes at —20°, 20 minutes at —10°, 150 minutes at 0°, and 65 hours at 15°. Eggs and pupae attached to foliage were destroyed by exposure to approximately 0° for 48 hours. Uninfested ears of green sweet corn exposed to —22° in a plate freezer showed a reduction of the cob-pith temperature to 0° after 3 or 4 hours, according to the variety; but when exposed to 0° in a ventilated cold room 15 hours were required for the cob-pith temperature to drop to 0°.

"The following exposures of infested ears of corn produced complete mortality of the larvae occupying tunnels in the cob pith: 4 hours in a plate freezer at —22°, 18 hours in a cold room at —20°, and 65 hours in a cold room at 0°. Exposure of ears packed in bushel boxes in a cold room at 30° killed only 15.6 percent of the larvae after 6 days.

"When green sweet corn is packed in bushel boxes having nonventilating covers, heat is accumulated, previous to the chilling, as a result of the rapid metabolism of the ears, and such packs are chilled with difficulty in a cold room at 0°. When corn was packed in ventilated boxes, however, and exposed in a cold room according to commercial practice, and the central spaces of the pack were subjected to 0° for 8 days, all the infesting larvae were killed. The treatment of corn in this manner for 8 days following establishment of air temperature of 0° in the central spaces of the pack is considered to provide a safe minimum interval of exposure in cold-sterilization practice.

"These experiments indicate that owing to the resistance to cold characteristic of the European corn borer, and because it inhabits a host providing insulation, corn must be processed by means of zero, or subzero, temperatures (Fahrenheit) if all the infesting larvae are to be killed."

Observations on the European corn borer and its major parasites in the Orient, W. B. CARTWRIGHT (*U.S. Dept. Agr. Circ. 289 (1933), pp. 14, figs. 3*).—In this contribution the author presents information secured on the European corn borer and its major parasites during two years of travel (1928–30) in parts of Japan and China. The pest was found in Hokkaido, Honshu, Shikoku, Kyushu, Taiwan (Formosa), Chosen (Korea), and eastern China during this period. Infestations were evident in these territories in one or more of the major host plants such as corn, millet, sorghum, hemp, beans, indigo, and hops.

The parasites of the corn borer observed included *Apanteles* sp., *Bracon atricornis* Smith, *Brachymeria* sp., *Ceromasia lepida* Meig., *Cremastus flavoorbitalis* (Cam.), *Hexamermis meridionalis* Stein., *Inareolata punctoria* (Roman), *Eulimneria alkae* E. & Sacht., *Macrocentrus gifuensis* Ashm., *Microgaster tibialis* Nees, *Phaeogenes* sp., *Xanthopimpla punctata* (Fab.), and *X. stemmator* (Thunb.).

A practical test of chemically treated bands for the control of the codling moth, E. J. NEWCOMER, A. R. ROLFS, and F. P. DEAN (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1056–1058*).—In tests made of chemically treated bands in the Yakima Valley, Wash., during three successive seasons, the increase in the wormy fruit was only 72.5 percent in the banded block, as compared with 204 percent in two blocks not banded but sprayed the same. It was estimated that an average of about 50 percent of the worms leaving the fruit were caught in the bands.

Mosquito control in Montana, G. A. MAIL (*Montana Sta. Circ. 143 (1933), pp. 13, figs. 4*).—This account deals particularly with control measures applicable to Montana conditions, where 40 species of mosquito are known to occur. Of these 6 are important. A brief preliminary account is followed by a discussion of natural control and a more extended account of artificial control.

Mosquito control (*N.J. Agr., 15 (1933), No. 1, pp. 5, 6*).—The use of mosquito traps during the season of 1932 in New Jersey demonstrated that intensive antimosquito work brings about a great reduction in the number of mosquitoes.

Mosquito larvicide, J. M. Ginsburg (*N.J. Agr., 15 (1933), No. 4, p. 4*).—The author has found that a larvicide consisting of two thirds by volume of kerosene or of a similar light petroleum oil, to which had been added enough pyrethrum extract to equal that of 1 lb. of pyrethrum flowers and one third water containing about 5 percent of soap, can be prepared or purchased at a cost even lower than that of oil per spray gallon. This stock solution is mixed with 9 to 10 parts of water prior to application and sprayed on the breeding place. It has been extensively used during the last two years by the mosquito commissions in New Jersey and other States on all kinds of fresh-water breeding places with an appreciable saving of money. It is the outcome of work aimed to meet objections to the use of white petroleum oil, which is injurious to waterfowl, fish, and aquatic plants.

Notes on Rocky Mountain Pipunculidae (Diptera), G. F. Knowlton (*Fla. Ent., 17 (1933), No. 2, p. 34*).—In this contribution from the Utah Experiment Station the author records the collection, while engaged in beet leafhopper investigations, of adults of four species belonging to the family Pipunculidae, namely, *Pipunculus unguiculatus* Cress., *P. subnitens* Cress., *P. horvathi* Kertesz., and *P. dubius* Cress. The importance of such collections lies in the fact that the larvae of species of this family of flies are adapted to a life of internal parasitism, the adults being very well fitted to capture and oviposit in small, active insects.

Notes on the life history of the apple maggot in Wisconsin, T. C. Allen and C. L. Fluke, Jr. (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1108–1112, fig. 1*).—Studies of the seasonal emergence of the apple maggot at the Wisconsin Experiment Station during 1932 showed that more than 37 percent of the flies emerged from 2-year-old pupae. The peak of the emergence of these flies occurred 8 days later than the normal brood, which affected timing of sprays. Yeasts dried at from 70° to 80° F., powdered, and mixed with 3 or 4 parts of honey proved considerably more successful for rearing the adult fly than did yeast and honey when water was added.

Morphology of the digestive tract of the apple maggot fly (Rhagoletis pomonella Walsh), R. W. Dean (*New York State Sta. Tech. Bul. 215 (1933), pp. 17, figs. 17*).—In this contribution the gross anatomy and histological structure of the digestive tract of the apple maggot are reported upon. The tract is essentially similar to that of the house fly or the blowfly *Calliphora erythrocephala.* The outstanding point of difference is the presence in the apple maggot of a diverticulum from the esophagus, anterior to the brain, to which the name esophageal bulb is given.

The culture of sterile maggots for use in the treatment of osteomyelitis and other suppurative infections, W. Robinson (*U.S. Dept. Agr., Bur. Ent., 1933, pp. 10*).—This is a revision of and supersedes the account previously noted (E.S.R., 69, p. 83).

Problems in the application of the maggot treatment of osteomyelitis and other suppurative infections, W. Robinson (*U.S. Dept. Agr., Bur. Ent., 1933, pp. 7*).—Information is here presented on maggot treatment for infections in connection with a list of 10 references to the literature.

Literature relating to the use of maggots in the treatment of suppurative infections (*U.S. Dept. Agr., Bur. Ent., 1933, pp. 7*).—This is a list of references to the literature arranged in chronological order.

Temperature as a possible limiting factor in the northern spread of the Colorado potato beetle, G. A. Mail and R. W. Salt (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1068–1075, fig. 1*).—This contribution from the Montana Experiment Station briefly reviews the history of the spread of the Colorado potato beetle from its native home.

"Data show that the lethal undercooling points of 80 individual beetles ranged from —4.3° to —11.6° C. The influence of hibernation depth and the probable effect of winter soil temperatures on hibernating beetles is discussed. Data are presented to show the protective influence of a snow covering, and some temperature data are tabulated from the Beaverlodge Experimental Station, in the Peace River district of northern Alberta, in an attempt to explain the absence of the beetle in that area, where its native food plants abound."

Food habits of Leis conformis Boisd. (Chinese ladybeetle), J. R. Watson and W. L. Thompson (*Fla. Ent., 17 (1933), No. 2, pp. 27–29*).—In this contribution from the Florida Experiment Station notes are presented on the food habits of the Chinese lady beetle *L. conformis*, introduced from California in 1925, as observed in the insectary and on its food habits in the field. It is thought that the present knowledge of the possible summer foods of this predator at a time when aphids are scarce should be sufficient to enable growers to establish it permanently in many groves in Florida, and that it will be a very great help in controlling the citrus aphids.

Habits, life history, and control of the Mexican bean beetle in New Mexico, J. R. Douglass (*U.S. Dept. Agr., Tech. Bul. 376 (1933), pp. 46, figs. 30*).—With the increased commercial acreage of beans in New Mexico, which resulted from the demand during the World War, the Mexican bean beetle became of increased importance in that State. This led to the studies conducted by the author from the summer of 1923 up to December 1931 here presented. They were carried on in the Estancia Valley, where the pinto bean (*Phaseolus vulgaris*) is the only variety grown commercially. The beetle was found to pass the winter in the adult stage only, it being confined primarily to the yellow pine forest zone, with conditions becoming more favorable where oak trees are found in the association.

"Contact moisture is the stimulus influencing emergence from hibernation. The time and intensity of the initial infestation of overwintered beetles depend on the summer rains and the prevailing temperature during the period of precipitation or subsequent thereto. The period between emergence from hibernation and oviposition averages about 10 days in the cool elevated areas of the State. The average number of eggs deposited per female is about 900. The developmental period from egg to adult depends on the seasonal temperature; in the Estancia Valley 40 days or longer is necessary.

"The bean beetle has no known natural enemies of economic importance in the Southwest. Drought periods are detrimental to eggs and larvae, especially when they are accompanied by dry hot winds. Investigations show that the bean beetle can be controlled with profit in dry-farmed areas where conditions warrant the use of control measures. Evidence is given that insecticidal 'burning' following the use of arsenicals is due to high humidity combined with low evaporation following the treatment. Spraying [and] dusting with calcium arsenate are the most economical control measures. Growers in the irrigated areas in the southern part of New Mexico can avoid injury to beans from the beetle by early and late planting. In the consolidated bean areas cooperative community collection and destruction of beetles along the foothills in the fall will contribute to the control of this insect. Evidence shows that burning forests in the spring is not effective in controlling the beetles. Bean hulls from fields which have been properly treated may be utilized as food for cattle."

Further investigations of the parasites of Popillia japonica in the Far East, C. P. Clausen, H. A. Jaynes, and T. R. Gardner (*U.S. Dept. Agr., Tech. Bul. 366 (1933), pp. 59, figs. 18*).—In this contribution the authors report upon studies covering the 5-year period from 1924 to 1928 in China and India, supplementing studies of the natural enemies of the Japanese beetle in Japan and Chosen (Korea) for 1920–23 previously noted (E.S.R., 56, p. 860).

Seven species of parasites were found to attack the Japanese beetle in Japan, and an additional 9 species parasitize other members of the genus *Popillia* in Chosen, Taiwan (Formosa), China, and India. Of this total, 5 species of Tachinidae and 1 of Pyrgotidae attack the adult beetles, 2 species of Dexiidae are parasitic internally in the grubs, and 8 species of Scoliidae are external parasites of the same stage. Large shipments of these parasites were made to the United States for colonization in the infested area. Biological data, with methods of rearing and shipping, are given for the different species. The climatic and agricultural conditions of China and India are compared with those of Japan and of the infested area in the United States (centering about Philadelphia), and the possible effect of the changed conditions upon the parasites is discussed.

Laboratory experiments with various fumigants against the wireworm Limonius (Pheletes) californicus Mann, R. S. Lehman (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1042–1051, pl. 1, fig. 1*).—In work conducted at the U.S.D.A. Bureau of Entomology Laboratory at Walla Walla, Wash., 13 fumigants were tested on the sugar beet wireworm and their median lethal concentrations in air determined under controlled conditions and compared with that of carbon disulfide. The time of exposure to the fumigant was 5 hours in all tests, the concentration being the variable factor. Some wireworms that appeared to be dead 15 days after exposure to carbon disulfide recovered and were able to walk 1 month after the exposure. The fumigants used ranged from 0.56 to 192.9 times as toxic as carbon disulfide, allyl isothiocyanate being the most toxic.

Some notes on the biology of the pea weevil (Bruchus pisorum L.) (Coleoptera, Bruchidae) at Moscow, Idaho, T. A. Brindley (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1058–1062, figs. 2*).—This is a discussion of the hibernation, egg deposition, life cycle, and length of life of the pea weevil, based upon observations at Moscow, Idaho.

The local dispersal of the pea weevil, A. O. Larson, T. A. Brindley, and F. G. Hinman (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1063–1068, figs. 2*).—In observations of the pea weevil in Oregon and northern Idaho, infestation was found to vary greatly in different parts of the field. The greatest number of adult weevils and the heaviest infestation of the growing peas were usually found on the edge nearest the source of infestation, near hibernation quarters, and in the hollows and swales.

Some tests with fluorine compounds against the pepper weevil (Anthonomus eugenii Cano), J. C. Elmore (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1095–1105, figs. 5*).—A report is made on a comparison of the insecticidal value of several fluorine compounds with that of calcium arsenate against the pepper weevil based on work in California in 1931 and 1932. "Sodium fluoaluminate (synthetic cryolite), potassium fluoaluminate, and barium fluosilicate gave a higher weevil mortality than did calcium arsenate, but, except in the case of potassium fluoaluminate, injury to the plants overshadowed weevil control. The injury was less pronounced in the absence of moisture or when silicon dioxide was added to the fluorine compound. Because of plant injury following treatments with fluorine compounds and the residue problem, these materials are not to be recommended as a control for the pepper weevil."

Irregularity among cotton plants in time of fruiting as a factor affecting susceptibility to damage by the cotton boll weevil, P. W. Calhoun (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1125–1128, fig. 1*).—In observations at Gainesville, Fla., considerable irregularity appeared to exist among cotton plants regarding earliness of fruiting. Using the time of appearance of the first blossom on each plant as the criterion, the frequency distribution for 600 plants approximated a normal curve, the maximum for the frequency histogram occurring on the eleventh day. It is suggested that such lack of uniformity in time of fruiting perhaps contributes to increased susceptibility of cotton to damage by the bollweevil.

Insect vectors of the Dutch elm disease, M. W. Blackman (*[U.S. Dept. Agr.], Bur. Ent., 1933, pp. 4, pls. 2*).—It is pointed out that four species of the genus *Scolytus*, namely, the large elm bark beetle (*S. scolytus* Fab.), the smaller elm bark beetle (*S. multistriatus* Marsh.), *S. laevis* Chap., and *S. pygmaeus* Fab., have been found associated with the Dutch elm disease due to *Ceratostomella* (*Graphium*) *ulmi* in Europe, and that any of these are capable of transmitting the spores of the disease to healthy elms. *S. scolytus* and *S. multistriatus* are considered the most important as vectors of the disease in Europe. *S. scolytus* being a much more aggressive form, it is considered of prime importance both as a vector of the fungus and as the cause of important injuries on its own account. *S. multistriatus* has been known to be established in this country since 1909, when it was found on elm trees in Cambridge, Mass. It is now known to occur in the environs of New York, N.Y., and in Philadelphia and at two points farther west in Pennsylvania. The findings in the survey made to determine the occurrence of this beetle are shown on an accompanying map.

It is stated that while the large elm bark beetle has been introduced into this country on imported logs, it is not known to have become established.

The number of larval instars and the approximate length of the larval stadia of Dendroctonus pseudotsugae Hopk., with a method for their determination in relation to other bark beetles, W. D. Bedard (*Jour. Econ. Ent., 26 (1933), No. 6, pp. 1128–1134, figs. 2*).—Investigators having encountered considerable difficulty in studying the life history and habits of larvae which mine beneath the bark of trees, the author describes a method whereby this can be accomplished, its application being demonstrated in the case of the Douglas fir beetle. The usefulness of this information in a thorough study of larval parasites and its value in the economic control of the Douglas fir beetle are shown.

Bees as pollinators, R. S. Filmer (*N.J. Agr., 15 (1933), No. 4, pp. 3, 4*).—Reference is made to experiments conducted with overwintered colonies and package bees to determine the most economical and most efficient pollinating unit under New Jersey conditions. In comparative tests conducted, 3- and 6-lb. packages of bees that were established on combs just prior to the blooming period exhibited from 40 to 60 percent of the activity of overwintered colonies. The results showed that the number of bees alone was not the deciding factor. Later experiments with overwintered colonies showed that the activity of a colony, measured by the number of bees returning to a colony in a unit of time, was directly proportional to the amount of brood present. The results appeared to support the view that the activity of a colony was governed by the "hive hunger"; that is, the greater the amount of brood that must be fed the greater the activity exhibited by a colony. This is considered to explain why package bees established only a few days before blooming period did not show the activity of overwintered colonies.

A note on the Apanteles parasites of the wax moth (Galleria mellonella L.) [trans. title], J. SUIRE (*Rev. Zool. Agr. et Appl., 32 (1933), Nos. 3, pp. 45–51; 4, pp. 63–66, fig. 1*).—This account deals with the biology of *A. hoplites* Ratzb., *A. lateralis* Hal., and *A. galleriae* Wilk., parasites of the wax moth.

The brown dog tick (Rhipicephalus sanguineus), a new agent in the natural transmission of the recurrent fever of Spanish Africa [trans. title], A. SERGENT (*Compt. Rend. Acad. Sci.* [*Paris*], *197 (1933), No. 14, pp. 717, 718*).—The author has found recurrent fever in Spanish Africa to be transmissible by the brown dog tick, nymphs that had engorged as larvae on infected guinea pigs conveying the spirochete to normal guinea pigs.

ANIMAL PRODUCTION

[Animal husbandry investigations of the Bureau of Animal Industry] (*U.S. Dept. Agr., Bur. Anim. Indus. Rpt., 1933, pp. 4–12*).—Data obtained in experiments with livestock are reported on the feeding of rations containing wheat or corn to pigs at restricted levels and the vitamin A, B, C, D, and G content of goat's milk; the effects of grass on meat quality, use of cottonseed meal in the corn ration for hogs previously softened on a peanut ration, grading live cattle and lambs and their carcasses, gland activity and weights in pigs, and curing and storing meats; feeding and breeding beef and dual-purpose cattle, sheep, and milk goats; wool and other animal fibers; feeding and breeding swine and horses; and breeding and feeding poultry and the effect of diet and other factors on the composition and hatchability of eggs.

A type of laboratory silo and its use with Crotalaria, W. M. NEAL and R. B. BECKER (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 8, pp. 617–625, fig. 1*).—The Florida Experiment Station constructed four small pit silos 43 in. wide and between 74 and 81 in. deep, with smooth concrete walls and clay and limerock bottoms, to determine their feasibility in establishing the ensilability of new forages. Chemical changes and losses of nutrients were of the same order as were usually encountered in large silos.

C. incana and *C. intermedia* forages made palatable silages when preserved in these experimental silos. *C. spectabilis* silage was eaten readily, but further investigations will be required on its toxicity. *C. striata* silage was not palatable to cattle. It is pointed out that even though some species of *Crotalaria* appear to have possibilities for silage purposes, other species will have to be tested, consideration given to cultural characteristics of the various species, and evaluation of the silages as a feed for livestock be made before recommendations concerning their use as silage for livestock can be presented.

[Artificial drying of alfalfa hay] (*N.J. Agr., 15 (1933), No. 1, p. 7*).—Two samples of alfalfa hay dried under ideal field-drying conditions contained about one fifth as much carotene as machine-dried samples from the same field. A sample cured under poor drying conditions contained only one tenth as much carotene as the machine-dried hay, which contained approximately as much carotene as fresh alfalfa. Sunlight may destroy as much as 30 percent of the carotene content of hay during one afternoon's exposure and 80 percent of the remainder during the following morning.

Factors influencing the palatability of hay, H. S. WILLARD (*Wyoming Sta. Bul. 199 (1933), pp. 35, figs. 2*).—In an effort to find a satisfactory method for determining the relative palatability of hays, the following factors in addition to total consumption were considered: (1) The effect of offering different amounts of the same hay, (2) effect of concentrate supplement, and (3) effect of including too few days in the test to obtain an accurate index of intake. From the results the following procedure is recommended: (1) When an animal can consume her nutrient requirements as specified by the Haecker feeding standard, feed a ration in which hay and concentrates each furnish one half of these nutrients, (2) if the hay is consumed for two consecutive days, increase the proportion of hay and continue to increase until more than 10 percent of the hay offered is refused, (3) feed for about 10 days the proportion of concentrates to hay on which approximately 10 percent of the hay is being refused. (4) The intake during this period may be used as an index of hay consumption, and (5) cows should be producing sufficient milk to make underfeeding on hay alone possible.

A total of 21 cuttings of Wyoming native hay and 11 cuttings of alfalfa were tested by the above-described method. The amount of irrigation previous to cutting was of more importance in influencing palatability of the native hays than the predominating variety of grass. Wire grass decreased in palatability as the season advanced, except where water had been applied until shortly before cutting, while sedge hays because of the nature of the soil in which they grew showed little decrease in this respect. Unfavorable curing conditions decreased the consumption of native hays. Such hays cut early in the season or those that had plenty of water late in the season were as palatable as alfalfa.

Second-cutting irrigated alfalfa cut in the early bloom stage was less palatable than first-cutting alfalfa at the same stage of bloom, but second-cutting at later stages of bloom was more palatable than first-cutting at similar stages. With the above exception the palatability of alfalfa decreased with the advance in bloom. The relative palatability of native hay was closely associated with its sugar content, but this was not true of alfalfa. Early- and late-cut sedge hays, early-cut wire grass hays, and late-cut wire grass hays having plenty of water before harvest were as palatable as the best grades of alfalfa.

Pasture fertilization, C. B. Bender (*N.J. Agr., 15 (1933), No. 4, p. 2*).—A study covering a period of 5 years showed that the carrying capacity of pastures increased as the nitrogen fertilization increased. In this work fertilization returned three for one on the money invested when checked against the barn feeding which was saved. During the dry season of 1932 the plat receiving 400 lb. of sulfate of ammonia carried 4.5 times as many animals as the plats receiving no nitrogen.

Rotational grazing insured cattle getting much of the grass when it was from 5 to 6 in. high, at which time it contained from 16 to 24 percent of protein. Application of at least 300 lb. of sulfate of ammonia per acre advanced the season at least 2 weeks, and the grass so raised was more nutritious, palatable, and succulent. Nonnitrogen fertilization furnished digestible nutrients at a lower unit cost than nitrogen fertilization, while nontreatment of pastures gave the lowest unit cost. However, unfertilized pastures did not produce either enough grazing or grazing of good quality, and the same was true of nonnitrogen treatments.

Commercial feeding stuffs, 1932–33, J. M. Bartlett (*Maine Sta. Off. Insp. 148 (1933), pp. 21–68*).—The usual report of the guaranteed and found analyses of 701 samples of feeding stuffs collected for official inspection for the year ended June 30, 1933 (E.S.R., 68, p. 798).

Inspection of commercial feeding stuffs, 1933, T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 277 (1933), pp. 55*).—The usual report of the guaranteed and found analyses of 386 brands of feeding stuffs collected for official inspection during the year ended June 1933 (E.S.R., 69, p. 90).

Selection and purchase of feeders and rations for fattening beef cattle, W. H. Peters (*Minnesota Sta. Bul. 300 (1933), pp. 68*).—The results obtained over a period of 12 years in an effort to determine the most profitable method of feeding beef cattle have been compiled in this bulletin. Many of these results have been noted in previous publications (E.S.R., 58, pp. 763, 866; 65, p. 365).

The author concludes that the trend in market prices during the feeding period, the ability to select a low-cost ration that produces a satisfactory finish in a normal feeding period, and the use that can be made of the manure produced are the most imoprtant factors affecting profits. Fattening thin cattle is best suited to a farming program where a large percentage of the farm acreage is adapted to the production of feed crops.

Beef cattle production in Louisiana, C. I. Bray (*Louisiana Sta. Bul. 244 (1933), pp. 21, figs. 7*).—The results obtained in studies to show what improvement could be made in grading up common cattle by the use of purebred bulls of various breeds, to compare Brahman grades with grades sired by beef bulls, and to obtain general information regarding methods of management suited to certain Louisiana conditions are reported.

There were indications of some advantages in introducing Brahman blood into commercial beef herds in the Gulf Coast area. Recommendations are included on such management practices as time of breeding, wintering, shelter, improvement of pastures, disease prevention, and use of minerals.

Feeding lambs on Illinois farms, W. G. Kammlade (*Illinois Sta. Circ. 413 (1933), pp. 28, figs. 9*).—The factors to be considered in the purchasing, shipping, feeding, and selling of lambs are discussed.

An iodine survey of New Zealand live-stock.—I, Sheep and lamb thyroids from Otago and Southland, E. Mason (*New Zeal. Inst. Trans. and Proc., 63 (1933), pt. 3, pp. 373–388, pls. 2, figs. 2*).—This paper presents the results of an extended survey of the iodine content of the soils and water of New Zealand by means of analyses of sheep and lamb thyroids.

[Protein supplements for swine] (*N.J. Agr., 15 (1933), No. 1, p. 5*).—Fish meal as a protein supplement to corn produced more economical gains than did tankage, and no difference was noted in the quality of the meat from the fish meal and tankage lots.

Tankage for swine, W. C. Skelley (*N.J. Agr., 15 (1933), No. 3, p. 6*).—In this note the author reports satisfactory gains from feeding digester tankage to swine.

The prevention of anemia in suckling pigs, with observations on the blood picture, T. S. Hamilton, G. E. Hunt, and W. E. Carroll (*Jour. Agr. Res. [U.S.], 47 (1933), No. 8, pp. 543–563, figs. 7*).—Continuing the work on nutritional anemia of swine (E.S.R., 66, p. 270) at the Illinois Experiment Station, observations were made on the weight, blood condition, and mortality of litters farrowed at different seasons of the year and subjected to different treatments.

Nutritional anemia was more prevalent, more severe, and the death rate was higher in February and March litters than in litters farrowed later. The condition was as common in litters kept outdoors in individual houses with access to concrete runways as in litters confined indoors, but the mortality under outdoor conditions was not so severe. Brushing the udders of sows with a dilute aqueous solution containing iron or iron and copper prevented anemia. This treatment for the first four weeks, followed by allowing the pigs access to a palatable feed mixture containing 0.1 percent of added ferric sulfate was as effective as brushing the udder for eight weeks.

Of 55 pigs farrowed in February and March, 96 percent became anemic and 40 percent of these died when no treatment was given. On the other hand, no anemia developed among 38 pigs farrowed during the same period when the iron or iron and copper solutions were applied to the sow's udder. Of 86 pigs having a blood-hemoglobin concentration of 3.5 g or less per 100 cc, 24 percent died, while only one of 109 pigs that were not anemic was lost. There were no subsequent ill effects among pigs receiving their mineral supplement through udder treatment. Exercise was not a factor in the development or prevention of anemia.

The average hemoglobin concentration of 163 pigs less than 24 hours old was 8.98 g per 100 cc of blood, and the average cell volume of 98 pigs of the same age was 44.1 percent. The correlation between the hemoglobin concentration and the cell volume was $r=+0.945\pm0.0024$. The correlation between hemoglobin concentration and hemoglobin saturation of the cells was $r=+0.606\pm0.014$. The correlation between the hemoglobin saturation and cell volume was $r=+0.360\pm0.020$. As the anemic condition grew worse, the blood-hemoglobin concentration, cell volume, number of cells, and hemoglobin saturation of the cells decreased, but there was no apparent change in the corpuscular volume. In the new-born pig the mean corpuscular volume of the erythrocytes was about $65\mu^3$ and the average hemoglobin content of an erythrocyte was 14×10^{-12} g. Pigs that grew fastest during the first three weeks were more apt to become anemic than those that grew more slowly. The correlation between the three weeks' increase in live weight and the three weeks' decrease in hemoglobin concentration was $r=0.33\pm0.070$. When farrowed, pigs had a hemoglobin concentration and a cell volume of practically the same magnitude as that of mature animals, but during the first three or four days these values decreased to about two thirds or three fourths of the respective birth levels. Suggestions are presented as to the possible causes of these initial decreases.

[Experiments with poultry] (*N.J. Agr., 15 (1933), No. 1, p. 6*).—Preliminary results with individual laying cages indicated that pullets placed in these cages when ready to lay would go through the first laying year in satisfactory condition. An all-mash ration containing approximately 14 percent of protein gave the best results. Under these conditions there was a reduction in the loss of birds due to prolapsis of the oviduct, but there were indications of kidney and other internal disorders. There was no saving in labor from the use of cages, and difficulties were encountered in the proper lighting and ventilation of houses.

Evidence accumulated during the year indicated that the capacity to produce a large quantity of eggs was not related or correlated with capacity to produce large-sized eggs.

Poultry breeder selection, W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 21 (1933), No. 1, pp.* [2]).—The technic of breeder selection, based on the inexpensive method previously noted (E.S.R., 70, p. 225), is explained in this pamphlet.

Breeder selection, W. C. Thompson (*N.J. Agr., 15 (1933), No. 5, pp. 5, 6*).—An exhaustive statistical study of more than 5,000 trap nest records showed that the egg yield during the 4 months' winter season was a reasonably useful criterion of measurement of inherited egg-producing capacity. There was no correlation between the capacity to produce eggs in the winter season and the capacity to produce eggs during the summer-fall season. On the basis of this analysis it is suggested that if trap nesting were stopped on February 1 it could be resumed on August 1 for those individuals that had a winter record minimum of 60 eggs. Such a scheme could be employed readily on the ordinary farm and would reduce the cost of obtaining records on breeding stock. Weighing the eggs produced during January was suggested as a measure of the capacity of the bird to lay large-sized eggs.

Rice and rice by-products as feeds for laying hens, C. W. Upp (*Louisiana Sta. Bul. 243 (1933), pp. 32*).—A series of five feeding tests involving 32 different lots of White Leghorn pullets was conducted to determine the value of rice by-products for poultry.

It was found that the rice byproduct rations compared favorably with the check ration in producing winter eggs and in annual production. None of the products used were distinctly detrimental to egg production, length of the productive period, hatchability of eggs, egg weight, or body weight. Rough rice was a nutritious, palatable grain for birds which, when ground, could satisfactorily make up 40 percent of an all-mash ration. Rice bran either heat-treated or untreated could be used to replace wheat bran or pulverized whole oats, or wheat bran and wheat shorts, or part of the yellow corn meal in laying rations. The percentage of free fatty acids present in rice bran after several months' storage was not diminished by heating to 140° F.

Brewers' rice at 18 to 55 percent levels could be successfully used to replace oats, wheat, or corn in the scratch grain, or part of the yellow corn meal in an all-mash ration. Rice polish was a satisfactory substitute for ground oats, wheat shorts, wheat bran, or both bran and shorts in laying rations. Various combinations of rice bran, rice polish, and brewers' rice were successfully substituted in the chick ration with good results. Eggs produced on rice rations were of good quality and kept well in storage.

At 12 weeks of age, chicks from rice-fed dams were as large as chicks from the check diet. A comparison of egg records showed that birds that died during the year were poorer layers than those that survived.

Egg yolk color, W. C. Russell and C. S. Platt (*N.J. Agr., 15 (1933), No. 3, pp. 6, 7*).—Preliminary results have shown that replacing yellow corn with white corn and omitting green plant tissue from the ration of laying pullets resulted in the production of eggs with pale lemon yellow yolks. The egg production and egg quality were essentially the same for the white and yellow corn groups.

The iodine content of hens' eggs as affected by the ration, O. H. M. Wilder, R. M. Bethke, and P. R. Record (*Jour. Nutrition, 6 (1933), No. 4, pp. 407–412*).—At the Ohio Experiment Station four lots of 10 Leghorn hens each were fed the same basal ration. After sufficient iodine determinations had been made while the birds were on the basal ration, the diets were changed so that lot 1 continued on the basal ration, lot 2 had potassium iodide added, lot 3, 2 percent of kelp, and in lot 4 the meat scrap was replaced by an equivalent amount of Menhaden fishmeal protein. In a second test three lots of six pullets each were fed the same basal ration, to which was added in the respective lots dried kelp, iodized linseed meal, and potassium iodide evaporated on dextrin.

Analyses of the eggs and rations showed that the iodine content of hens' eggs varied directly with the amount of this element in the diet. Adding 2 and 5 mg of iodine per bird daily in the form of dried kelp, iodized linseed meal, or potassium iodide increased the iodine content approximately 75 and 150 times, respectively. Upon discontinuance of iodine feeding the percentage of the element in the eggs decreased at once. The form in which iodine was fed had no effect upon the amount in the egg.

Is the production of off-flavor eggs an individual bird characteristic? J. H. Vondell (*U.S. Egg and Poultry Mag., 39 (1933), No. 4, pp. 18, 19, figs. 2*).—A study at the Massachusetts Experiment Station showed that off-flavored eggs, commonly called "fishy eggs", were produced by a few individuals in a flock. The evidence indicated that such eggs were probably caused by an inherited ability to produce eggs with an unbalanced proportion of chemical constituents. The odor was always present in the yolk. There was considerable variation between individuals in the percentage of off-flavored eggs produced and in the intensity of the odor.

A study of egg flavor in stored oil-treated eggs, R. R. Slocum, A. R. Lee, T. L. Swenson, L. H. James, and M. C. Steinbarger (*U.S. Egg and Poultry Mag., 39 (1933), No. 4, pp. 14–17, 47, fig. 1*).—In a cooperative study between the U.S.D.A. Bureaus of Chemistry and Soils, Animal Industry, Home Economics, and Agricultural Economics, five lots of eggs were stored from March to December to determine the effects of mineral oils (E.S.R., 69, p. 704) on the flavor of the eggs out of storage and to compare these results with the candled grades of the eggs. The temperature of the storage room was maintained at from 29° to 30° F., with a relative humidity of from 89 to 90 percent. At the end of the storage period the eggs were regraded, cooked in boiling water for 3 minutes, and the yolks sampled by taste.

The results showed that the deteriorative changes in eggs during storage, which resulted in low grading before the candle, were not necessarily accompanied by off flavors. On the other hand, objectionable flavors may occur in storage eggs that graded high when candled. The colorless, tasteless, and odorless mineral oils of widely different specific gravities and pour points used for preserving the eggs during storage did not adversely affect the flavor.

Eggs and egg products (*U.S. Dept. Agr., Bur. Chem. and Soils Rpt., 1933, p. 18*).—Results are reported for studies on the cause and prevention of deterioration of eggs during storage.

[Experiments with rabbits] (*U.S. Dept. Agr., Bur. Biol. Survey Rpt., 1933, p. 12*).—Results obtained in studies at the U.S. Rabbit Experiment Station, Fontana, Calif., are reported for breeding and feeding tests and the morphology and physiology of the growth and development of skin and hair.

DAIRY FARMING—DAIRYING

[Dairy cattle and dairying investigations of the Bureau of Dairy Industry] (*U.S. Dept. Agr., Bur. Dairy Indus. Rpt., 1933, pp. 1–10, 11, 12, 13–20*).—Data obtained in experiments with dairy cattle are reported on the nutrition of dairy cows (pp. 2, 3), relation of the conformation and anatomy of the dairy cow to her milk and butterfat producing capacity (pp. 7, 8), health and fertility studies in the Beltsville herds (pp. 8, 9), feeding and management investigations at Beltsville (pp. 9, 10), breeding and feeding studies at the field experiment stations (pp. 11, 12), and herd-improvement investigations (pp. 15–17).

In the dairying work, results were noted in studies on the bacteriology and chemistry of milk, including the practicability of using concentrated frozen milk as a table milk; effect of varying factors on the quality of ice cream; oxidation of milk fats; improved methods of manufacturing whey albumin, lactose, casein, and Swiss cheese (pp. 3–6); chocolate-flavored milk, homogenized milk, and relation of butterfat content to flavor in standardized milk (pp. 13–15); and dairy manufacturing investigations and introduction (pp. 17–20).

[Experiments with dairy cattle] (*N.J. Agr., 15 (1933), No. 1, pp. 3, 4*).—A group of 18 grade Holstein heifers was raised for the first 6 months on a dry grain mixture. During the winter their ration consisted of silage, poor grade alfalfa hay, and oat straw, and during the summer they were kept on pasture until they freshened. At the beginning of their lactation period the animals averaged 118.9 percent normal in weight and 100.2 percent normal in height. During the first lactation the heifers averaged 28.2 lb. of milk and 0.95 lb. of fat and during the second lactation 30.1 lb. of milk and 1.1 lb. of fat per day. The breeding history of these animals was normal. There was no evidence of stunting due to early feeding methods.

During 1931 each acre of pasture at the experiment farm produced 279.2 lb. of gain in weight for the entire herd for the season. The highest carrying capacity was 2.2 cows per acre on a plat fertilized with 500 lb. of sulfate of ammonia, 250 lb. of superphosphate, 150 lb. of muriate of potash, and 1,000 lb. of lime per acre.

In tests with calves it was found possible to prevent distemper by keeping the animals on wooden floors. It is recommended that these floors be made temporary so that they can be taken up, cleaned, and disinfected periodically.

Feeding standards for dairy cows, E. T. Halnan (*Jour. Dairy Res.* [*London*], *1* (*1929*), *No. 1, pp. 3–34*).—In this monograph from the School of Agriculture, Cambridge University, England, the author describes feeding standards for milk cows. He reviews and evaluates the various feeding standards and the scientific evidence upon which they are based. The changes that have been made in standards are pointed out and their relation to the advance in the knowledge of animal nutrition shown.

The author suggests that from the evidence a suitable feeding standard for milk production would be (1) for maintenance of a 1,000-lb. cow, 5,446 calories net energy or 5 lb. starch equivalent, containing 0.5 lb. of digestible protein or 0.6 lb. of protein equivalent, and (2) for the production of 1 gal. of 4 percent milk, 2,777 calories net energy or 2.5 lb. of starch equivalent, containing 0.48 lb. of digestible pure protein or 0.57 lb. of protein equivalent. A table showing the requirements for milk of various fat percentages is attached.

Oat feed as a substitute for roughage, T. M. Olson (*South Dakota Sta. Bul. 281* (*1933*), *pp. 12*).—Using the double reversal method in two tests, two lots of three cows each were fed for 10-day experimental periods. In the first trial the ration consisted of corn silage and a grain mixture of ground oats, ground corn, and linseed meal. The cows were fed all the wild hay or oat feed that they would consume. In the second trial the feeding was the same, except that the hay and oat feed were fed at the rate of 1 lb. per 100 lb. of live weight. Difficulty was encountered in getting some cows to eat the oat feed at first, but later they ate it readily.

The results showed that oat feed could be used as the sole dry roughage for dairy cows, but it was slightly less palatable than good quality wild hay. For the maintenance of live weight, oat feed and wild hay were approximately equal, but the hay was slightly more efficient than the oat feed for maintaining milk and fat production. The relative cost of the two feeds should be the determining factor in their use. To prevent waste, it is recommended that oat feed be fed in a tight container and indoors.

Phosphorus requirement of dairy cattle when alfalfa furnishes the principal source of protein, C. F. Huffman, C. W. Duncan, C. S. Robinson, and L. W. Lamb (*Michigan Sta. Tech. Bul. 134* (*1933*), *pp. 75, figs. 3*).—Continuing this study (E.S.R., 70, p. 82), it was found that the phosphorus requirements for growth were not directly proportional to body weight but probably depended on the rate of growth. For this reason the procedure followed during the first 4 years of this experiment, namely, feeding 0.2 percent of the dry matter as a low phosphorus ration and 0.41 percent as the optimum phosphorus level, was not a satisfactory method of studying phosphorus requirements. During lactation this system of feeding was also unsatisfactory, since the low level supplied sufficient phosphorus for a low milk production but was inadequate for liberal production.

Anorexia was the most pronounced symptom of phosphorus deficiency, and a low blood inorganic phosphorus was the usual precursor of the condition. Depraved appetite was not a reliable criterion for diagnosing the phosphorus deficiency. For maintenance 10 g of phosphorus per 1,000 lb. of live weight and for milk production from 0.5 to 0.7 g of food phosphorus per pound of milk above maintenance were required.

The 0.7 g supply was also sufficient for reproduction, but it was recommended that 0.75 g of food phosphorus per pound of milk be used to care for all variations. During the periods of low production and during the dry period when cows were in an advanced stage of gestation, the results indicated that 17 g of phosphorus per 1,000 lb. live weight should be fed daily.

Variations recorded in the study of the conformation and anatomy of 318 dairy cows having records of production, W. W. Swett, F. W. Miller, R. R. Graves, and C. A. Matthews (*U.S. Dept. Agr., Bur. Dairy Indus., 1933, pp. 6+[9]*).—This preliminary report is a summary of the ante-mortem and post-mortem data obtained from 98 cows of the U.S. Dairy Experiment Farm at Beltsville, Md., and 220 cows at 18 State experiment stations. All of the cows used had production records made prior to January 1, 1931. The data are divided according to the breeds of cattle.

A study of some points of conformation and milk yield in Friesian cows, F. H. Garner (*Jour. Dairy Res.* [*London*], *4* (*1932*), *No. 1, pp. 1–10*).—The results reported in this study from the School of Agriculture, Cambridge, England, were based on measurements of 461 Holstein cows in Minnesota. Attempts were made to correlate 19 measurements with milk yields.

Significant coefficients of correlation were found between milk yields and the following measurements: Length from withers to pins, length from withers to hooks, height at hooks, height at pins, circumference of chest, circumference of barrel, and area of milk wells. Correlation coefficients that were almost significant were obtained for width at barrel and width at hooks with milk yields.

The highest producing cows had the largest milk wells. This was not due entirely to the size of the cows, because there was practically no loss of coefficient of correlation for milk yield and size of milk wells when the partial correlation for area of milk wells and yield was calculated with height at hooks held constant. There was evidence that the area of milk wells did not increase with skeletal growth after 4.5 years of age, but did increase with increased milk production. The results confirm the value of some of the features that receive consideration in judging dairy cattle. They also emphasize the necessity of considering all the factors together, but indicate that certain features need special consideration.

Selection and management of the dairy herd sire, G. A. Bowling (*West Virginia Sta. Circ. 67* (*1933*), *pp. 15, figs. 4*).—The basis for selecting a bull for the herd sire and his care and management are discussed.

Fly control, J. W. Bartlett (*N.J. Agr., 15* (*1933*), *No. 3, pp. 2, 3*).—Tests with several groups of cows in the southern part of New Jersey showed that during periods of heavy cattle fly infestation some cows shrunk in their production of milk and percentage of fat at the same time. Spraying for the control of these flies tended to prevent losses in production due to this nuisance.

Investigations on the milk of a typical herd of Shorthorn cows, I, J. Golding, J. Mackintosh, and E. C. V. Mattick (*Jour. Dairy Res.* [*London*], *4* (*1932*), *No. 1, pp. 48–73, fig. 1*).—This is a preliminary report covering a 3-year period of an investigation by the National Institute for Research in Dairying on the composition of milk as produced under typical south of England conditions. Ten dairy Shorthorn cows of varying ages and calving at different times of the year were selected as a typical small herd.

It was found that 13.7 percent of the 1,074 samples analyzed for the butterfat of morning milk fell below 3 percent, while no evening sample contained less than 3.6 percent. The percentages of solids-not-fat were 9 for morning milk and 8.9 for evening milk for the whole period. The results of the analyses for ash, calcium, phosphorus, and nitrogen in samples of morning milk taken at weekly intervals were more remarkable for their uniformity than for the variations. The rennet tests showed that during the winter months the time required to coagulate milk may be almost double the time taken in the summer. A comparison of estimated nonfatty solids with the figures calculated from the fat and specific gravity indicated a seasonal relationship between these figures.

The effect of nine-, twelve-, and fifteen-hour intervals during the day and the night on milk production, K. W. D. Campbell (*Jour. Dairy Res. [London], 4 (1932), No. 1, pp. 28–36, figs. 6*).—Tests were conducted at the University of Reading, England, from November 1931 to July 1932 and in an extended study the previous winter to show that the length of interval between milkings does affect the fat percentage, and that the time of day during which the milk is synthesized is a factor of importance.

The results showed that more milk and fat were produced per hour during 9-, 12-, and 15-hour night intervals than during similar intervals in the day. In this case the milk increment was greater than the fat increment. More milk and fat were produced during the interval from midnight to noon than from noon to midnight. In this case the fat increment was greater. It was concluded that night itself makes a definite contribution to the low fat percentage in morning milk.

The errors involved in certain methods of estimating the lactation yield of milk and butterfat, J. Houston and R. W. Hale (*Jour. Dairy Res. [London], 4 (1932), No. 1, pp. 37–47*).—Data collected at the Agricultural Research Institute for Northern Ireland were analyzed to determine whether the system of milk recording as practiced in Northern Ireland is satisfactory.

Standard deviations of the errors in the calculated milk yields, on a weekly and 2-week basis, for 24 cows showed that weekly weighings gave results which approximated closely the true milk yield. The standard deviations of the errors in the calculated butterfat percentages, as well as the maximum errors, showed that as the interval between tests lengthened from 1 to 8 weeks the errors increased. When tests were made at intervals of 6 weeks most of the errors in calculated butterfat percentage were less than 8.5 percent, but in some cases the errors were over 12 percent. It was recommended that in order to insure errors not exceeding 10 percent the intervals between butterfat tests should not exceed 1 month.

Studies in lactation.—I, Variations in some chemical and physical properties of the milk from individual quarters of a cow, E. C. V. Mattick and H. S. Hallett (*Jour. Dairy Res. [London], 1 (1929), No. 1, pp. 35–49, figs. 5*).—In a study at the National Institute for Research in Dairying, England, analyses were made of the milk from the separate quarters of the udder of a cow at intervals throughout her lactation period.

Distinct variations were found in certain properties of the milk. These differences occurred for the amount of milk yielded, the acidity, the time of coagulation with rennet, and the percentage of butterfat. In general, the milk from the two front and the two hind quarters seemed to be similar, but there were distinct differences between the milk from the fore and hind quarters. Occasionally markedly different values were obtained for the milk from any one quarter which appeared to have no relationship to the values for all the other quarters. This was apparently due to a physiological condition for which there was no obvious explanation.

The influence of the stage of lactation on the natural acidity of milk, J. HOUSTON (*Jour. Dairy Res.* [*London*], *2* (*1931*), *No. 2, pp. 179–183, fig. 1*).—This study was designed to obtain information on how natural acidity varied, especially with the advance of lactation. Weekly tests were made of the evening milk of each cow in the herd of the Agricultural Research Institute of Northern Ireland over a period of about two years.

The acidity was highest at the beginning and lowest at the end of lactation. The fall was not uniform but was fairly rapid during the first eight and the last seven weeks of lactation. During the interval between these periods the value was fairly uniform. It was concluded that the stage of lactation was an important factor which influenced the acidity of the milk of a cow.

Daily fat variations, F. C. BUTTON (*N.J. Agr.*, *15* (*1933*), *No. 5, p. 3*).—In this article the author shows how milk varies in its butterfat content from day to day. For this reason a composite sample using representative portions of each day's milk is necessary to overcome these daily fluctuations as a basis for purchasing milk at receiving plants.

Vitamin A in milk, W. C. RUSSELL (*N.J. Agr.*, *15* (*1933*), *No. 4, p. 3*).—The results of studies have shown that less than 5 percent of the vitamin A value in the amount of dried alfalfa and corn silage usually fed appears in the milk of dairy cattle. For this reason it did not seem that increasing the amount of alfalfa and silage in the ration would increase the vitamin A content of the milk. When the yellow pigment, carotene, is converted into vitamin A by the cow it appears in the milk in a colorless form. However, some of the carotene passes into the milk unchanged and is largely responsible for the color of the milk. The vitamin A value of the best grade of milk was not more than 1,500 fat units per quart.

The bacteriological examination of milk.—I, Modification of the agar plate-count method. II, The use of the methylene blue reductase test at 15.5° C. as a method of determining the keeping quality of milk, E. R. HISCOX, W. A. HOY, K. L. LOMAX, and A. T. R. MATTICK (*Jour. Dairy Res.* [*London*], *4* (*1932*), *No. 1, pp. 105–121, figs. 6*).—Studies at the National Institute for Research in Dairying, England, showed that neither lactose nor other sugars tested, casein peptone, nor yeast extract could satisfactorily replace milk as a means of correcting the discrepancies often observed between plate counts of the 1/100- and the 1/1000-cc dilutions of milk on standard agar. Attempts are being made to produce a medium which will eliminate the milk and which will combine the ease of making and the transparency of the standard agar with the efficiency of the medium enriched with milk.

The results of a test with a modification of the keeping quality test for milk by the use of the methylene blue reduction test at 15.5° C. are described. A close correlation between the appearance of taint as detected by taste and the discharge of the color of methylene blue was indicated.

The plate method of estimating the bacterial content of milk—the limitations of procedure in common use, with suggested improvements, J. F. MALCOLM (*Jour. Dairy Res.* [*London*], *4* (*1932*), *No. 1, pp. 91–104, figs. 3*).—This study at The West of Scotland Agricultural College, Glasgow, was planned to examine the general problem of the reliability of a limited number of parallel plate counts as an index of the viable bacterial content of samples of milk.

As a result of this study it was recommended that in the routine examination of milk the 1/10 dilution bottle and plates be omitted. A modified method for preparing the 1/100 and 1/1000 dilution plates was suggested. It was also recommended that five parallel plates for the 1/100 dilution and two plates for the 1/1000 dilutions be used. This method gave reliable results in samples with counts of 50,000 or more organisms per cubic centimeter and fairly reliable results with counts up to 100,000, but when accurate estimates were desired with counts in the neighborhood of 100,000 at least five plates would have to be used for the 1/1000 dilution. It is pointed out that reliable information as to the purity of milk cannot be obtained from a single test, but must be had from a series of tests performed at intervals over a period of several months.

A note on the direct microscopic count of bacteria in milk, H. R. WHITEHEAD (*Jour. Dairy Res. [London], 2 (1930), No. 1, pp. 81–83*).—A few experiments were carried out at the Massey Agricultural College, New Zealand, to determine under what conditions organisms could be detected in milk. Added organisms did not acquire staining properties sufficient to render them visible until they began to multiply in the milk. Apparently only the younger individuals produced by multiplication had strong staining properties. The older individuals on a solid medium appeared to lose, to a great extent, their capacity for taking up stain. This phenomenon was evidently limited to growths on solid media. This may be the cause of certain discrepancies in bacterial counts.

Studies in the metabolism of the lactic acid bacteria.—I, Nitrogen metabolism, J. G. DAVIS and A. T. R. MATTICK (*Jour. Dairy Res. [London], 4 (1932), No. 1, pp. 81–90, figs. 6*).—Experiments were conducted at the National Institute for Research in Dairying, England, to determine the availability of various amino acids and protein fractions for true lactic acid bacteria. Strains of *Streptococcus lactis, Lactobacillus plantarum,* and *L. casei* isolated from Cheddar cheese, of *S. lactis* and *S. cremoris* from Orla-Jensen's laboratory, and type cultures from the Lister Institute were used in the work. The bacteria were grown on media containing various amino acids and salt mixtures.

It was found that true lactic acid bacteria could not grow in a medium in which the sole source of nitrogen was an amino acid mixture or an ammonium salt. The presence of growth factors, such as yeast, did not permit the utilization of this "simple" nitrogen. Streptococci grew faster in those peptones containing the higher amounts of the higher fractions of protein. They also grew best upon a peptic casein digest which was about 15 days old. Lactobacilli, however, grew better when the digestion of this medium had progressed further. The authors discuss the significance of these observations from the viewpoint of bacterial metabolism, the sequence of flora in ripening cheese, and the preparation of casein digest media.

The influence of other bacteria on the production of acid by lactic streptococci in milk, G. A. COX and H. R. WHITEHEAD (*Jour. Dairy Res. [London], 2 (1931), No. 2, pp. 164–175, figs. 9*).—Experiments at the Massey Agricultural College, New Zealand, were intended mainly as a study of the effects of several organisms on the growth and metabolism of lactic streptococci in milk. Four organisms commonly found in contaminated milk, namely, *Bacillus coli, B. subtilis,* a staphylococcus, and *B. faecalis alkaligenes,* were grown in milk in association with lactic streptococci and the acidity produced in a given time determined.

B. coli decreased acid production in some tests and increased it in others, while *B. subtilis* always appeared to stimulate acid production. The staphylococcus had a slight stimulating effect, but the effect of *B. f. alkaligenes* was not significant. There were no indications that any of the organisms caused the cessation of acid production.

The influence of bacilli of the colon group on the production of acid by lactic streptococci in milk, H. R. WHITEHEAD and G. A. COX (*Jour. Dairy Res. [London], 4 (1932), No. 1, pp. 74–80, figs. 4*).—Continuing the above work, a study was made of the effect of colon bacilli on the production of acid in milk under conditions simulating those occurring in the earlier stages of the process of cheese manufacture.

Growing colon bacilli in milk for from 3 to 16 hours partially inhibited the subsequent formation of acid by lactic acid streptococci. This action was not entirely due to the increased pH or to the lactic acid produced by the colon organism. It was evident that other organisms were formed, and that the action of these substances was not significantly modified by heating at 75° C. for 1 hour. The authors discuss the possible practical significance of this phenomenon.

A study of S. paracitrovorus as a starter in butter-making, E. C. G. MADDOCK (*Jour. Dairy Res. [London], 2 (1931), No. 2, pp. 203–207*).—Experiments were carried out at the National Institute for Research in Dairying, England, to determine the practical value of pure cultures of *Streptococcus citrovorus* and *S. paracitrovorus* as starters.

Although butter of exceptionally fine flavor was produced by the use of pure cultures of *S. paracitrovorus* under laboratory conditions, the uncertainties encountered under practical conditions, due to its weak growth, were so marked that its general use is not warranted. Both cultures were unable to compete successfully with the inevitable contaminants met in practice. The study also confirmed the value of vegetable media, such as grass, silage, and bean agar, for growing *S. paracitrovorus*, but the subsequent growth in milk media lacked vigor.

Starters, S. KNUDSEN, trans. by E. R. HISCOX (*Jour. Dairy Res. [London], 2 (1931), No. 2, pp. 137–163, pl. 1, fig. 1*).—In this paper from the Royal Veterinary and Agricultural College, Köbenhavn (Copenhagen), the author reviews the present knowledge of the preparation, use, and advantages of butter starters, cheese starters, and starters for dietetic sour milk products.

Practical pointers on making creamery butter in the South, J. G. WINKJER, F. W. BURNS, and A. D. BURKE (*U.S. Dept. Agr. Circ. 294 (1933), pp. 35, figs. 10*).—In cooperation with the Alabama Experiment Station, a study was made of the faults in the manufacture of butter in that State. The information was obtained by visits to creameries and through butter samples submitted for educational judgings.

The defects of butter and methods of preventing them; the control of the composition of butter; plant practices for preventing losses of butterfat; and methods of analyses for fat and acidity in milk, cream, skim milk, and buttermilk; and for determining the composition of butter are discussed. Time-saving charts showing the correct amount of different ingredients to go into butter of a definite composition are included.

Methods for manufacturing acid-precipitated casein from skim milk, C. S. TRIMBLE and R. W. BELL (*U.S. Dept. Agr. Circ. 279 (1933), pp. 36, figs. 6*).—Available information of practical value to present to prospective manufacturers of acid-precipitated casein is given in this publication. Methods for manufacturing uniformly high-quality lactic, sulfuric, and hydrochloric casein are described. Methods for determining the properties of commercial casein are also included.

The influence of bacilli of the colon group on Cheddar cheese, H. R. WHITEHEAD (*Jour. Dairy Res. [London], 2 (1930), No. 1, pp. 76–80, pl. 1*).—Experiments at the Massey Agricultural College, New Zealand, showed that representative strains of organisms of the colon group had a deleterious effect on the flavor of Cheddar cheese when added to the milk just before the start of the manufacturing process. Even when present in large numbers they did not produce gas holes if an active culture of lactic streptococci was used as a "starter." This indicates that their metabolism was so modified by association with the starter that while they grew they produced little or no gas. In this study they had no influence on the texture of the cheese, nor did they appreciably affect the production of acid by the starter in the milk or curd. Since they did not cause decolorization of annatto in a colored cheese, it did not seem likely that they were responsible for mottling in cheese.

Frozen fruits for ice cream, J. C. Hening and A. C. Dahlberg (*New York State Sta. Bul. 634 (1933), pp. 19*).—The purpose of this study was to increase the use of frozen fruits in ice cream and to determine ways of so using them as to increase the popularity of such ice cream.

The flavor, appearance, and texture of strawberry ice cream were improved when the sirup from sliced berries stored at 0° F. in an 80 percent cane sugar sirup was added to the mix in the freezer and the chilled berries stirred into the ice cream after it was drawn. By allowing the sliced berries, after thawing, to stand overnight in the sirup in which they were packed, the objectionable hardness of the frozen slices in the ice cream was overcome. Mixing whole raspberries which had been stored as above described in ice cream after it was drawn from the freezer resulted in an excellent product. The sirup and coloring matter should be added to the mix in the freezer. The use of from 20 to 25 percent of strawberries or raspberries produced excellent flavor. Storing at 15° for 6 months destroyed the fresh fruit flavor of these berries.

Peaches packed at the rate of 5 lb. to 1 lb. of cane sugar and stored at 0° produced good ice cream when from 25 to 30 percent of the fruit was used. The pulped peach skin increased the flavor of this fruit in ice cream. Apricots packed at the rate of 4 lb. to 1 lb. of sugar and frozen gave a satisfactory flavor, especially when heated to 180° to 190° for 5 minutes before freezing.

In making a fruit ice cream the body, texture, and flavor were improved by adding 2 percent of fat, 1.5 percent of serum solids, and decreasing the sugar content 2 percent to make allowance for the dilution with sirup.

Why does a tallowy flavor develop in strawberry ice cream? O. E. Ross (*Ice Cream Trade Jour., 29 (1933), No. 7, pp. 23–25*).—This study at the Iowa Experiment Station was designed to determine the causes of tallowy flavor in strawberry ice cream. A total of 22 standardized mixes made as nearly alike in all respects as possible, with the exception of the milk solids-not-fat, was used in this work.

No changes in the degree of oxidation of fats of a magnitude that could be detected by the usual chemical technic occurred during the development of the off flavor. However, the trend of flavor development indicated that fat oxidation might be the cause of the defect. Oxidation absorption, as measured by the test for oxidase, gave no proof that oxidizing agents had any part in the development of the off flavor, nor did iron seem to be a factor. The defect also developed in control samples containing no strawberries, indicating that this defect in flavor may appear in any kind of ice cream but that it may be masked by flavoring materials used in certain cases. Samples made with condensed skim milk as a rule contained more copper and developed this flavor defect before similar samples made with dried skim milk. It was felt that the copper in the condensed product, together with the oxidation of the fat of condensed skim milk that might occur during the manufacture and storage periods, were at least partially responsible for the defect. In addition, larger amounts of solids from condensed milk were introduced by that product than were obtained from dried skim milk in the manufacture of the ice cream.

Abstracts of literature on the manufacture and distribution of ice cream (*Harrisburg, Pa.: Internatl. Assoc. Ice Cream Manfrs., vols. 3 (1929), pp. [3]+XIV+160+V+52, figs. 25; 4 [1931], pp. XIV+127+V+26, figs. 25; 5 [1933], pp. XIV+178+V+24, figs. 20*).—These are the third, fourth, and fifth volumes of the literature concerning ice cream. Appended to each are practical facts and statistics for the ice cream manufacturer (E.S.R., 61, p. 267).

VETERINARY MEDICINE

[Work in animal pathology and parasitology of the Bureau of Animal Industry] (*U.S. Dept. Agr., Bur. Anim. Indus. Rpt., 1933, pp. 12–16, 17–27, 32–47*).—Work of the year is referred to on hog cholera investigations; tuberculin and mallein; stained antigen for pullorum disease diagnosis; investigations of dips, disinfectants, and anthelmintics; infectious abortion; tuberculosis; vesicular stomatitis; eradication of scabies; eradication of dourine; meat inspection; research on bovine mastitis, tuberculosis, swine erysipelas, *Brucella suis*, infectious equine encephalomyelitis, shipping fever, anaplasmosis, and nasal granuloma; investigation of stock-poisoning plants; toxicological investigations; an infectious disease of guinea pigs; pullorum and other diseases of poultry; tick eradication; tuberculosis eradication; virus-serum control; parasites of horses, ruminants, swine, and poultry; miscellaneous parasites; and treatment for internal and external parasites.

Annual administration report of the civil veterinary department in Ajmer-Merwara (British Rajputana) for the year 1932–33, M. Mohey-Deen (*Ajmer-Merwara Civ. Vet. Dept. Ann. Admin. Rpt., 1932–33, pp. [3]+10*).—This report includes tables on infectious diseases of livestock and inoculation work of the year.

Annual report on the Civil Veterinary Department, United Provinces, for the year 1932–33, S. G. M. Hickey (*United Provs. [India], Civ. Vet. Dept. Ann Rpt., 1933, pp. [2]+III+23*.—This report includes an account of control work with infectious diseases of livestock (pp. 2–4).

Annual report of the department of veterinary science and animal husbandry for the year ending 31st December 1932, H. E. Hornby et al. (*Tanganyika Ter. Dept. Vet. Sci. and Anim. Husb. Ann. Rpt., 1932, pp. II+95*).—In part 2 of this report (E.S.R., 68, p. 667) H. J. Lowe deals with the occurrence of and control work with diseases of livestock during the year (pp. 2–13) and in part 3 S. A. Evans deals with the work at the veterinary laboratory at Mpwapwa (pp. 13–71), which includes notes on trypanosomiasis research by H. E. Hornby (pp. 24–28) and animal nutrition research by M. H. French (pp. 29–71).

[Contributions in comparative pathology and parasitology] (*Japan. Path. Soc. Trans., 22 (1932), pp. 760–764, figs. 3; 840–842, 950–961, 970*).—Among the contributions presented are the following, all in Japanese with translated titles: Studies of Worms Infesting Weasels, by S. Yoshida, M. Iwata, and K. Toyoda (pp. 760–764); Patho-histological Findings of Cerebro-spinal Meningitis in Plague of Domestic Fowls, by M. Kodama and S. Yamagiwa (pp. 840–842); Tumour Producing Properties of the Blood of Chicken and Duck Bearing Sarcoma, by K. Iida (pp. 950–952); Studies of Chicken Sarcoma, by F. Ohshima and S. Tomozawa (pp. 952–956); On an Active Immunity of the Fowl Sarcomas, by N. Ishimoda (pp. 956–961); and Further Studies of Chicken Sarcoma, by S. Tomozawa (p. 970).

Index Veterinarius, [April 1933] (*Index Vet., 1 (1933), No. 1, pp. [1]+XXXVI+304*).—The introductory part of this mimeographed index is devoted to explanations and to a list of journals, with a key to the abbreviations (pp. V–XXXVI). The main portion (pp. 1–300) gives the titles and references alphabetically by subject and author for the signed articles listed in the January, February, and March 1933 numbers of the *Veterinary Bulletin*. At the end (pp. 300–304) the anonymous articles are given.

Host-specificity and specificity of animal parasites, E. R. Becker (*Amer. Jour. Trop. Med., 13 (1933), No. 5, pp. 505–523*).—This contribution is presented under the headings of host specificity and specificity of the protozoa (pp. 506–513), of the parasitic worms (pp. 513, 514), and of parasitic arthropods (pp. 514–517), and factors affecting host specificity (pp. 517–522).

A few supplements to the study on infection and immunity in "Manchurian fever" and "typhus" of rats, K. Takahashi and M. Kodama (*Kitasato Arch. Expt. Med. [Tokyo], 10 (1933), No. 4, pp. 259–266*).—In summarizing the information presented, the authors (E.S.R., 69, p. 582) point out the resemblance of typhus to certain protozoal diseases. Experiments show that the eruptive fever of rats is a latent infection, producing a very slight immunity, so that the host can be infected many times over; thus the rats become a permanent source of endemics (for man) and of epidemics (for rats) of eruptive fever in nature.

Typhus and Rocky Mountain spotted fever in the United States, R. E. Dyer (*Mil. Surg., 72 (1933), No. 6, pp. 421–439*).—A practical summary of information on these arthropod-transmitted diseases.

Bang's disease (infectious abortion), J. M. Buck (*U.S. Dept. Agr., Farmers' Bul. 1704 (1933), pp. II+17, figs. 2*).—This is a revision of and supersedes Farmers' Bulletins 790 and 1536 (E.S.R., 58, p. 73).

A study of the opsono-cytophagic power of the blood and allergic skin reaction in Brucella infection and immunity in man, I. F. Huddleson, H. W. Johnson, and E. E. Hamann (*Amer. Jour. Pub. Health, 23 (1933), No. 9, pp. 917–929, fig. 1*).—Contributing from the Michigan Experiment Station, the authors report that the studies which they have conducted on citrated blood of humans (who were known to have had undulant fever in past years and shortly after recovery, who are actively infected, or who have had no history of the disease) have shown that the in vitro activity of the polymorphonuclear cells in whole citrate blood for *Brucella* is an expression of immunity to *Brucella* and an indication of the progress toward recovery in active infection. "The absence of or a low phagocytic activity obtained in conjunction with a negative allergic skin test is evidence of suceptibility to *Brucella* infection. Infection in an individual is indicated by a positive allergic skin test obtained with *Brucella* nucleoprotein in conjunction with negative or low opsonocytophagic activity of the whole citrated blood for *Brucella*."

The pathogenesis of brucelliasis Bang [trans. title], J. van der Hoeden (*Tijdschr. Diergeneesk., 60 (1933), No. 19, pp. 1025–1038; Ger., Eng., Fr. abs., p. 1038*).—In attempts to trace the route of infection of *Brucella abortus* from the site of introduction, animals were infected either orally or by the conjunctival sac, and a few were inoculated intracutaneously. With the dog the organism was cultivated from the blood 1 day after infection, with the goat and horse after 3 days, and with the guinea pig after 8 days. With the guinea pig positive cultures were obtained from the regional lymphatic glands of the introduction area after 1 hour, from the spleen after 1 day, and from the liver after 3 days. With the dog the cultures from the spleen and regional lymphatic glands were positive after 1 day.

The study is considered to have shown that the bacteria escape directly from the regional lymphatic glands into the venous system very shortly after their introduction into the animal.

The 1932 outbreak of foot-and-mouth disease in southern California, J. R. Mohler and R. Snyder (*U.S. Dept. Agr., Misc. Pub. 163 (1933), pp. 11, figs. 3*).—This is a detailed account of the tenth outbreak of foot-and-mouth disease in the United States, which was discovered in southern California in April 1932 and eradicated within 10 days after its diagnosis. The details of the outbreak, including diagnosis and methods employed in eradication, are presented.

The preparation of johnin from a synthetic medium without the addition of B. phlei, G. W. Dunkin (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 159–164, figs. 4*).—The author records the successful cultivation on one occasion of the causative agent of Johne's disease on the surface of a synthetic medium without the addition of acid-fast organisms or their extracts. It is pointed out that johnin, although not of high potency but possessing allergic activity as shown by tests applied on four selected bovines, has been prepared by the author.

Bacteria as food for Oesophagostomum columbianum larvae, R. E. Rebrassier (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 787–790*).—In cooperative work by the Ohio Experiment Station and the Ohio State University, "eggs of the nodular worm *O. columbianum* obtained free from feces and rendered free from bacteria hatched in agar cultures of *B*[*acterium*] *coli* and the larvae developed to the infective stage. Eggs placed on sterile agar hatched normally, but the larvae failed to develop to the infective stage. The data derived from this experiment indicate that the larvae of *O. columbianum* utilize living bacteria as food in their development to the infective stage."

[Studies of psittacosis], R. D. Lillie (*U.S. Pub. Health Serv., Natl. Inst. Health Bul. 161 (1933), pp. III+66, pls. 7*).—Part 1 of this report deals with the pathology of psittacosis in man (pp. 1–46); part 2 with the pathology of psittacosis in animals and the distribution of *Rickettsia psittaci* in the tissues of man and animals (pp. 47–66).

An outbreak of surra among the wild deer (Cervus unicolor var.) of Mauritius, A. R. D. Adams and F. E. Lionnet (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 165–167*).—An account of an outbreak which appeared in April and May 1933, when a large number of deer were found sick and dying.

Tuberculosis of human origin in an Amazon parrot, W. R. Hinshaw (*Amer. Rev. Tuberc., 28 (1933), No. 2, pp. 273–278, fig. 1*).—This contribution from the California Experiment Station records a case of tuberculosis of the human type in a male Amazon parrot (*Amazona* sp.)

The cockroach as a possible carrier of tuberculosis, H. C. Read, Jr. (*Amer. Rev. Tuberc., 28 (1933), No. 2, pp. 267–272*).—The experiments reported are considered to show that the cockroach may be considered a possible mechanical carrier of tuberculosis for the following reasons: "(1) All smears of the intestinal tracts were positive, thus showing that the cockroach will eat positive tuberculous sputum; (2) these organisms when recovered from the intestinal tracts are viable, for they produced typical lesions in the guinea pig; and (3) microscopic sections did not show the bacilli to be present in the tissues, thus showing that they remain in the intestinal tract.

An experimental study of the "Bennett and Kenny" reaction in guinea-pigs infected with Trypanosoma equiperdum, I. Tchernomoretz (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 168–173, figs. 5*).—An experimental study of the so-called Bennett and Kenny reaction (E.S.R., 60, p. 869) on guinea pigs artificially infected with *T. equiperdum* led to an appreciation of the diagnostic value of this method, which is clear and reliable and gives early results. With the first appearance of *T. equiperdum* in the blood of the host, that is, from 10 to 15 days after infection, the reaction tends to rise a little and then stabilizes, without ever failing, even during the stages of crisis, at which time no trypanosomes are to be found in the blood of the subjects.

The control of camel trypanosomiasis, S. C. J. BENNETT (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 174–185*).—This contribution is presented in connection with a list of 12 references to the literature.

A review of undulant fever, J. MILLS (*Jour. Dairy Res. [London], 1 (1930), No. 2, pp. 180–184*).—This brief review is presented in connection with a list of 20 references to the literature.

Investigations on the pathogenicity of the Swedish undulant fever virus [trans. title], E. HENRICSSON and B. LINDSTRÖM (*Skand. Vet. Tidskr., 23 (1933), No. 8, pp. 381–401, figs. 2; Eng. abs., pp. 399, 400*).—Experimental work with gravid horses, sheep, pigs, goats, and dogs, in which the undulant fever virus was introduced intravenously and by ingestion, has led the authors to conclude that the Swedish virus of undulant fever is of bovine origin, a view hitherto based largely on epidemiological and epizootic data.

"Brucellin", a possible specific for undulant fever in man.—Preliminary report, I. F. HUDDLESON and H. W. JOHNSON (*Amer. Jour. Trop. Med., 13 (1933), No. 5, pp. 485–504, figs. 6*).—This contribution from the Michigan Experiment Station contains reports of 12 cases of undulant fever and the results of their treatment with brucellin. Included are graphs of 6 of the cases giving the temperature shortly before, after, and during treatment.

This agent is prepared by growing three species of *Brucella*, namely, *B. melitensis*, *B. abortus*, and *B. suis*, in separate flasks of beef liver infusion broth, adjusted to a pH of 6.6, for 60 days at 37° C. "The inoculated flasks are shaken vigorously at weekly intervals. At the end of the stated growing period each flask is examined bacteriologically and if found contaminated is discarded. The broth is clarified by centrifugation at a speed of 3,000 r.p.m. for 4 hours. The clear liquid is decanted and adjusted to a pH of 7 with N/1 HCl. The product from each of the three species is now pooled and filtered twice through sterile Berkefeld N filters. The filtered liquid is transferred to sterile flasks or tubes and incubated for 5 days at 37° C. to determine sterility. It is standardized and transferred to sterile 1-cc vials or stored in larger containers until ready for use. The duration of its potency has not been fully determined."

A study of the therapeutic value of this agent was commenced in 1930. The 12 cases here reported were selected to represent a total of 80 cases treated under the authors' direction. "The selected group contains cases of the disease in children as well as adults due to *B. melitensis*, *B. abortus*, and *B. suis*, and several from which *Brucella* was not isolated. Of the total number of cases that have been treated, 18 were negative culturally and serologically. These were diagnosed as undulant fever on the basis of the combined results of the opsonocytophagic and intradermal test. The diagnosis was arrived at only after careful examination of each of the patients and elimination of all other diseases. They have responded to treatment in essentially the same way as those from which we have isolated one of the species of *Brucella* or obtained a positive agglutination in high titer.

"Not all cases of long standing, that is, 8 months or over, respond to treatment as readily as do those that are treated early. We have a record of 4 cases, 2 of which are still being treated, in which the course of the disease has not been altered by treatment with brucellin.

"It appears from the data collected on cases which we have studied that an early diagnosis of the disease is essential if immediate beneficial results from the use of brucellin are to be expected. If the recommended number of 1-cc doses of brucellin can be given, complete recovery can as a rule be obtained within 12 to 15 days in those cases in which the symptoms are of only 1-day duration or up to 3-months duration."

It is said that the brucellin may be used without dangerous consequences if a precaution is taken to determine the sensitiveness of the patient before administering it intramuscularly. It should, however, never be injected intramuscularly into an individual who has recovered from the disease, due to the severity of the systemic reaction which follows. The authors' observations and experience with the disease in man in the United States and in the Mediterranean countries have convinced them that the remarkable results which have been obtained after using this agent cannot be ascribed to a mere coincidence.

Poisoning of cattle by species of groundsel (Senecio longilobus Benth. and Senecio riddellii Torr. & Gray), F. P. Mathews (*Texas Sta. Bul. 481 (1933), pp. 20, figs. 11*).—In this work, conducted in cooperation with the U.S.D.A. Bureau of Animal Industry, a description is given of an affection of cattle appearing in the Big Bend area of Texas, losses from which occur sporadically during any season of the year but are heaviest during the summer time. Its resemblance in the clinical syndrome of the disease to the manifestations of poisoning by certain species of *Senecio* led to the studies reported.

It was found to be reproduced by feeding *S. longilobus* and *S. riddellii*, and that as little as 20 lb. of these plants may prove fatal. The symptoms may not appear for some weeks or even more than a month after a lethal dose of the plants. The poisoning is characterized by continuous walking, the sudden appearance of nervous disturbances, diarrhea accompanied by tenesmus, and other symptoms of illness. Icterus, edema of the visceral peritoneum, hepatic cirrhosis, and distention of the gall bladder are outstanding lesions found on post mortem. The affection is practically identical with that caused by feeding other species of *Senecio* in other countries.

A list is given of 22 references to the literature.

Notes on the experimental transmission of bovine anaplasmosis in Florida, D. A. Sanders (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 799–805*).—In work at the Florida Experiment Station anaplasmosis was transmitted to a cow and a young bull by adults of the American dog tick which had engorged in the larval and nymphal stages on clinical cases of the disease. The periods elapsing between exposure of the animals and the appearance of the protozoan parasites in the erythrocytes were 39 and 51 days, respectively. Death occurred in the cow on the sixth day and in the bull on the seventh day following clinical evidence of the disease. Anaplasmosis was transmitted mechanically in a mild form under favorable conditions by means of *Tabanus fumipennis* Wied. and *Stomoxys calcitrans*.

Trypaflavin in a case of Babesia bigeminum in a bullock, G. A. Ajwani and P. M. Thillanayagam (*Indian Vet. Jour., 10 (1933), No. 2, pp. 128, 129*).—This is a report of a case of piroplasmosis in a 5-year-old bullock. The intravenous injection of 20 cc of a 2 percent solution of trypaflavine and repeated twice in 15-cc doses caused the disappearance of *B. bigeminum*.

Bovine contagious abortion, T. M. Doyle (*Jour. Min. Agr. [Gt. Brit.], 40 (1933), No. 6, pp. 491–505*).—This is a practical account giving a brief résumé of existing knowledge of infectious abortion, including an outline of control and eradication measures.

Studies on bovine mastitis.—VIII, The control of chronic streptococcus mastitis, F. C. MINETT, A. W. STABLEFORTH, and S. J. EDWARDS (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 131–138*).—In this continuation of the work previously noted (E.S.R., 68, p. 671), the authors report on observations extending over a period of five years that were made in a self-contained herd consisting of 53 cows and heifers, of which, in June 1928, 10 were affected with chronic streptococcus mastitis.

"Preventive measures in which, during the first two years, the infected cows were milked last and subsequently kept on separate premises, have led to the formation of a group of cows which for three years and six months has remained free from the streptococci which cause the chronic and contagious form of mastitis. Of the 10 originally infected cows, 2 stayed on the farm for over four years, 4 for between two and three years, and 4 for varying periods up to two years. Two other infected cows were located later. Altogether, 5 of those which were under observation for the longest time appeared to have made a complete recovery."

The control of rinderpest in a large dairy herd in Shanghai, China, H. E. KEYLOCK (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 149–158*).—It is pointed out that the serum-simultaneous method of conferring immunity against rinderpest entails considerable risks, produces an uncertain degree of immunity, and causes severe economic loss, and should be avoided where other methods of protecting cattle can be employed. The formolized splenic vaccine employed by Daubney in Kenya (E.S.R., 64, p. 677), which confers an immunity for at least 12 months, has been employed by the author since April 1932.

The author concludes that specific bovine piroplasmosis may be conveyed by virulent rinderpest goat blood when it is used as an inoculum in the simultaneous method of protecting cattle against rinderpest.

The eradication of bovine tuberculosis, L. JORDAN (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 184 (1933), pp. 104, fig. 1*).—This contribution discusses the subject under the headings of the need for eradication, methods of tuberculosis eradication, summary of methods and results in experimental eradication, and interpretation and reliability of the double intradermal test. Appendixes giving the details of methods of eradication adopted in the experimental area, details of individual herds, cost of eradication, and measures taken in various countries to combat bovine tuberculosis are included.

In the experimental control work an area of some 9 sq. miles northeast of Mauchline, Ayrshire, bounded by good roads and containing 37 farms, was selected, the project finally including 30 farms. The plan provided that cooperating farmers receive free tuberculin testing and free expert advice, with the understanding that they were to attempt to eradicate the disease from their herds by isolation methods. In the course of the 3-year period, 28 of the 30 herds made substantial progress; 20 were free from infection at the end of the experiment as compared with 8 at the beginning; and 8 others gave substantial reductions in the number of reactors.

The common sheep-scab mite and its control, O. G. BABCOCK and W. L. BLACK (*Texas Sta. Bul. 479 (1933), pp. 34, figs. 7*).—Requests for information from the Livestock Sanitary Commission of Texas led to the experimental work being conducted by that commission, the U.S.D.A. Bureau of Entomology, and the station, cooperatively, which commenced in 1924.

It is pointed out that this mite, found in practically all parts of the world, is spread from sheep to sheep by direct contact or through infested quarters or range, but does not thrive on any other domestic animal or on man.

"In experimental tests the time elapsing between artificial infestation and the appearance of first symptoms of scabies varied from 12 to 51 days. Where clean animals were in contact with scabby ones the appearance of scabies symptoms varied from 54 to 154 days. In a series of 51 tests under the most favorable conditions off the host, the mites lived from 1 to 38 days (average, 12 days and 6 hours). Direct sunlight at summer temperatures in southwest Texas will quickly destroy sheep scab mites removed from the host. They may be starved for at least 13 days and still produce scabies when placed on a sheep.

"In pens from which scabby sheep had been removed, infestation of clean sheep was obtained in three instances only. In one of these the clean sheep were introduced into the pen immediately after the scabby ones were removed; in the other two after 6 and 10 days, respectively. Infestation of clean sheep occurred in only one of three trials in which clean sheep were put in the pens 10 days after the scabby sheep were removed. No infestation of the clean sheep occurred in two cases in which the pens were vacant for 15 days before clean sheep were introduced, and none in other tests in which the interval was longer. It is possible for young mites to hatch off the host and to infest sheep if they gain access to the animal not later than the seventeenth day after the parent mites are removed from the host.

"The mite can be destroyed and scabies completely eliminated by thoroughly dipping the sheep twice, 10 days apart, in an aqueous nicotine sulfate solution containing at least 0.07 percent of nicotine or a lime-sulfur solution containing at least 0.18 percent of polysulfides. Finely ground divided sulfur in suspension, sodium fluoride, sodium silicofluoride, and commercial extract of derris root also seem promising when two or more dippings are used. It is dangerous to use arsenical cattle dip on sheep for this purpose, for in the strength which has to be used to kill the mites it may prove poisonous to the sheep."

"Pulpy kidney disease" of young lambs in North Wales, R. F. Montgomerie and W. T. Rowlands (*Vet. Jour., 87 (1931), No. 9, pp. 401–410*).—This is a report of the study of a disease that has been observed each spring since 1924 to cause considerable loss among young forward lambs 3 to 6 weeks old in North Wales. It has been found to be identical with the pulpy kidney disease described by D. A. Gill in New Zealand.[2]

The authors have found the primary predisposing conditions in North Wales to include the age of the lamb, its markedly forward condition, and the quick growth of spring grass, these factors being closely interrelated. "Field observations make it appear that the injection of lamb dysentery serum at birth has markedly reduced loss from this pulpy kidney disease. In a proportion of the cases investigated during the spring of 1931 diluted filtered intestinal contents were highly toxic on intravenous injection to rabbits and to mice. Such material from one case produced only mild transient symptoms on injection into a normal 4-week-old lamb.

"Antitoxic sera prepared against the toxins of *Vibrion septique*, of *B*[*acillus*] *welchii* (lamb dysentery), and of *B. oedematiens* did not neutralize the toxicity of intestinal filtrate, but exposure to 60° C. for one hour rendered this filtrate atoxic to mice."

Pulpy kidney disease of young lambs in North Wales: The toxicity of intestinal contents and the nature of the toxic element, R. F. Montgomerie and W. T. Rowlands (*Vet. Jour., 89 (1933), No. 9, pp. 388–398, pl. 1*).—This contribution is in continuation of that noted above.

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[2] New Zeal. Jour. Agr., 34 (1927), No. 4, pp. 217–230, figs. 2; 36 (1928), No. 3, pp. 149–153; 38 (1929), No. 6, p. 390; 42 (1931), No. 5, pp. 300–302.

"Observations showed that the toxic element in the filtrates from pulpy kidney cases was not neutralized by the following antisera: *B*[*acillus*] *oedematiens, Vibrion septique, B. welchii,* and *B*[*acterium*] *paludis.* It was, however, completely neutralized by *B*[*acillus*] *ovitoxicus* antiserum and by an antiserum prepared against *B. welchii* (Wilsdon, type D). Lamb dysentery antiserum gave inconsistent results, two batches giving no neutralization, one batch partial, and a fourth batch complete neutralization, despite the ability of each to completely neutralize the toxin produced in vitro by a long-isolated, well-recognized strain of *B. welchii* (lamb dysentery). The toxic element in the six filtrates from lamb dysentery cases was completely neutralized by *B*[*acterium*] *paludis* antiserum and by the only batch of lamb dysentery serum used—that which gave only partial neutralization with pulpy kidney filtrates."

Report on pulpy kidney disease of lambs: An acute enterotoxaemia of bacterial origin (*Vet. Jour., 89 (1933), No. 9, pp. 399–407*).—This is an abstract of a report by D. A. Gill upon a disease known as pulpy kidney in New Zealand, dealing with the subject as follows: Introduction (pp. 1–3); part I, general and epidemiological observations on the disease (pp. 3–29); part II, the etiology of pulpy kidney disease (pp. 30–49); and an addendum: Relationship of *B*[*acillus*] *ovitoxicus* (N.Z.) to Wilsdon's *B. welchii* (type D) (pp. 49–52).

On the incidence of stomach worms in lambs in the north of Scotland and their control by progressive sectional grazing, D. ROBERTSON and A. H. H. FRASER (*Jour. Helminthol., 11 (1933), No. 4, pp. 187–194*).—This contribution reports upon the results of work conducted with stomach worms in the alimentary tract of sheep in the north of Scotland, where in 1932 six severe outbreaks took place in the Counties of Kincardine, Aberdeen, and Moray, resulting on several farms in a loss of from 10 to 20 percent of the lambs. On post-mortem examination in these outbreaks the lesser stomach worm (*Ostertagia circumcincta*) was found to be present in very much larger numbers than any other parasite. *O. trifurcata* sometimes occurred in small numbers, but no attempt was made to separate the two.

In a close examination of the abomasum contents of six untreated lambs in different areas it was found that *O. circumcincta* far exceeded *H*[*aemonchus*] *contortus* or any other species in the number present.

The findings have led the authors to conclude that *O. circumcincta* is the principal cause of parasitic gastritis in lambs in the north of Scotland.

The bilharzia complement fixation reaction in goats infected with Schistosoma mattheei and Schistosoma bovis, N. H. FAIRLEY (*Jour. Helminthol., 11 (1933), No. 4, pp. 181–186*).—The author reports upon an investigation for the bilharzia complement fixation reaction to *S. mattheei* and *S. bovis* of the sera of 18 goats, using as antigen alcoholic extract of the livers of snails (*Planorbis exustus*) infested with cercariae of *S. spindale.* The sera of 5 of 7 goats harboring *S. mattheei* and of all of 4 goats exposed to alimentary infection with *S. bovis* yielded positive results, the range of complement fixation varying from 5 to 20 m.h.d. The sera of noninfected goats and of 3 goats exposed to infection with cercariae of *S. mansoni,* from which these animals appear naturally immune, yielded negative reactions.

It is pointed out that the complement fixation reaction with cercarial antigen (*S. spindale*) has now been applied to infestation with 3 human and 4 cattle schistosomes, and its group applicability to mammalian schistosomiasis may be regarded as proved.

Further studies on natural Brucella infection in swine, H. W. JOHNSON, I. F. HUDDLESON, and E. E. HAMANN (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 727–746, figs. 2*).—This contribution from the Michigan Experiment

Station, the details of which are given in tabular form, presents information on the nature of natural *Brucella* infection in 345 head of hogs showing agglutinins in their blood for *Brucella*.

"The hogs were situated in three separate herds maintained under different conditions from the standpoint of controlling the disease. The data indicate that *Brucella* infection of the hog is a self-limiting disease and may be brought under control or eliminated from a herd by means of the blood test made at intervals of 30 days. All reactors, even those reacting to a slight degree, should be separated from the negative reacting ones. The causative organism is well distributed throughout the body of the infected hog. The only species of *Brucella* found occurring in naturally infected hogs was *B. suis* (Traum)."

Developments concerning hog cholera, C. H. Stange (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 764–769*).—This contribution was presented at the annual meeting of the American Veterinary Medical Association in August 1933.

A tissue vaccine for hog cholera, W. H. Boynton (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 747–763, figs. 3*).—Two methods of vaccination employed in the work in California here reported are described. The results obtained in experimental work indicate that "a definite resistance was produced, and that essential factors for a potent vaccine are from 1.5 to 5 percent of eucalyptus oil, as the attenuating agent, and formative tissue, particularly red marrow of bone, as well as the lymphatics. The presence of other tissues appears to lessen the potency of the vaccine somewhat; gelatin-saline diluting fluid may be inferior to glycerin-saline diluting fluid in this respect. One intraperitoneal injection, if properly administered, appears as effective as two intramuscularly. The vaccine described has no therapeutic effect on a sick pig or on one in the incubation period of hog cholera. It is simply a prophylactic measure. No transmission of hog cholera occurred through cohabitation of susceptible pigs with animals which were undergoing vaccination."

An outbreak of "paratyphoid" in pigs, W. P. Blount (*Vet. Rec., 13 (1933), No. 40, pp. 969, 970, 971*).—Observations and experiments by the author have led to the conclusion that *Salmonella suipestifer* is capable of causing disease in pigs. The symptoms exhibited by ailing animals probably depend to a large extent upon the method of transmission, whether by ingestion or inhalation. When the organism is ingested necrosis and inflammation of certain parts of the digestive tract will follow, whereas if inhaled pneumonic symptoms more often occur.

Equine melanomatosis, J. McFadyean (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 186–204, figs. 8*).—This is a report of a study of a disease to which all gray horses are specially predisposed and which may have originated as a mutation.

"The evidence regarding the nature of the melanoblasts is inconclusive, but the balance is in favor of the view that they are derived from the mesenchyme and not from epithelium. A fact strongly against the latter view is that tumors arising in connection with the epithelium of the skin—the epitheliomata—are usually devoid of pigment and have a histology entirely different from that of the melanomata. The development of the tumors in gray horses is etiologically connected with the progressive diminution in the amount of melanin in the hairs, and further evidence is required regarding the histology of the skin in foals and animals under the age of five years. No satisfactory theory regarding the acquirement of neoplastic characteristics by normal melanoblast cells of the horse's skin has yet been presented."

The "graduated tube method" for estimation of the erythrocyte content of the blood as a clinical aid in the treatment of cases of equine

piroplasmosis, C. Davenport (*Jour. Roy. Army Vet. Corps, 4 (1933), No. 3, pp. 108–114, figs. 9*).—A description is given of the graduated tube method, which provides an easy means of ascertaining whether any destruction of red cells has taken place.

Recent progress in the investigation of poultry diseases, T. Dalling (*Vet. Jour., 89 (1933), No. 10, pp. 441–449*).—A practical digest of recent work in avian pathology.

Recent advances in our knowledge of poultry diseases, [I]–III, H. P. Bayon (*Vet. Rec., 13 (1933), Nos. 28, pp. 655–669, figs. 2; 32, pp. 773–782, figs. 3; 39, pp. 940–947, fig. 1*).—This contribution consists of three lectures delivered at the Imperial College of Science, in the first of which management and nutrition in relation to the pathology of fowls, the minute duodenal tapeworm *Davainea proglottina*, and research on fowl paralysis and allied conditions are considered (pp. 655–669). The second lecture deals with the significance and importance of vitamins in relation to poultry nutrition and hygiene (pp. 773–782), and the third with fowl pox and fowl canker and coccidiosis (pp. 940–947).

Diseases of poultry: Their prevention and treatment, H. P. Bayon (*London: Feathered World, [1933], pp. 155, pl. 1, figs. 36*).—This is a practical guide for poultry keepers.

An apparatus for pipetting serum in making the agglutination test for the detection of carriers of bacillary white diarrhoea (*Vet. Rec., 13 (1933), No. 40, pp. 966–968, figs. 5*).—By the use of an apparatus devised for pipetting serum from 400 to 600 samples can often be handled by one worker per hour with the aid of assistants. This is said to be based upon the plan of the apparatus described by Beaudette in 1929 (E.S.R., 62, p. 565).

Survival of coccidia of the chicken in soil and on the surface of eggs, D. E. Warner (*Poultry Sci., 12 (1933), No. 6, pp. 343–348*).—In experiments in Connecticut aimed at determining the period that coccidial oocysts may survive in soil, it was found that "material taken from poultry ranges and houses and fed to chicks produced infections at intervals up to 49 days but not at 81 and 370 days after exposure to infected chickens. Soil from experimental plats heavily seeded with oocysts produced infections in chicks at all periods up to 197 days after such seeding, but failed after 217 and 231 days."

In experimental tests for the survival of oocysts, it was found that washings of eggs from various sources, some fresh and some after 18 days in incubation, failed to infect chicks. "Washings of eggs dipped in a solution containing large numbers of oocysts and then incubated failed to infect chicks after 10 and 14 days of incubation. The view that coccidiosis may be transmitted via the egg during incubation is not supported by results obtained in this investigation. The attempt has not been made to ascertain differences with respect to the survival time of oocysts of the various species of *Eimeria* of the chicken."

Ocular lesions in epidemic blindness of fowls, G. M. Findlay and J. Wright (*Jour. Compar. Path. and Ther., 46 (1933), No. 3, pp. 139–148, figs. 6*).—The authors here present histological evidence to support the view that epidemic blindness in fowls is closely related to fowl paralysis (lymphomatosis gallinarum). "Lesions associated with epidemic blindness in fowls were found in the optic tracts, optic nerves, choroid, retina, pecten, iris, intrinsic and extrinsic ocular muscles, as well as in the conjunctiva and connective tissue of the orbit. No evidence of ocular lesions due to lack of vitamin A was found in hens suffering from epidemic blindness."

Studies on fowl-pox vaccination, E. L. Brunett (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 774–786*).—In the experimental work here reported the inoculation of chickens with cow pox virus failed to immunize against fowl pox. "Fowl pox virus was not readily propagated on pigeons and rabbits. Undiluted glycerin has a destructive action on pigeon pox virus in pigeon skin lesions. A 20 percent solution of glycerin seems to be a desirable concentration for preserving the virus in pigeon skin lesions. The inoculation of S[ingle] C[omb] White Leghorn cockerels 11 weeks old with pigeon pox virus failed to protect them against inoculation exposure with fowl pox virus. The inoculation of 62-day-old S. C. White Leghorn cockerels with pigeon pox virus failed to protect all of them against natural exposure to fowl pox virus. The birds were allowed 79- and 100-day post-recovery periods. As compared with the nonimmunes, there was some immunity produced against fowl pox virus."

[Infectious laryngotracheitis of the fowl], F. R. Beaudette (*N.J. Agr., 15 (1933), No. 2, pp. 6, 7*).—Reference is made to the method of immunizing fowls against this disease, accounts of which by the author have been noted (E.S.R., 69, p. 279; 70, p. 102), and by which 7,000 birds were inoculated in the preceding nine months. In none of the vaccinated birds had the disease been observed, notwithstanding the fact that the disease had recurred annually since 1923.

Fowl leucosis, F. D. Patterson (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 816–818, figs. 2*).—This is a case report of fowl leucosis in a Barred Plymouth Rock pullet at Ames, Iowa.

Fowl paralysis, F. R. Beaudette (*N.J. Agr., 15 (1933), No. 3, p. 2*).—Experiments with fowl paralysis have led the author to conclude that the disease is transmitted through the egg, there being no evidence that it is transmitted by cohabitation. In preliminary control work chicks hatched from eggs held near 68° F. for 1, 2, and 3 weeks, respectively, before setting failed to develop the disease, but cases of paralysis developed in chicks from similar eggs all of which had been set within 1 week of laying.

Effect of mercurial ointment on hatchability, A. Deakin and G. Robertson (*Poultry Sci., 12 (1933), No. 6, pp. 378–381*).—In work at the Dominion Experimental Farm, Ottawa, Canada, the authors have found that "the embryos in eggs set under hens treated with mercurial ointment die before the third day of incubation. Eggs were set under treated hens for 48, 36, 24, 12, and 2 hours, respectively, then transferred to the incubator. There is a gradation of mortality that is complete for eggs set under treated hens for 48 hours, but not apparently affecting those set under treated hens only 2 hours. Eggs were treated with 'light' and 'heavy' doses (the size of an alfalfa seed and twice this amount, respectively) of mercurial ointment directly, then artificially incubated. A few embryos survived this treatment, indicating a resistance either on the part of the embryo or egg membranes to the poison.

"It is concluded that mercurial ointment should not be used on breeding stock during, and probably 2 or 3 months previous to, the breeding season."

Studies on yeast-like fungi from gallinaceous birds, E. Jungherr (*[Connecticut] Storrs Sta. Bul. 188 (1933), pp. 19*).—In continuation of the author's studies, in which a severe outbreak of mycosis was reported (E.S.R., 69, p. 113), the epidemiologic occurrence of yeastlike fungi and their identification is taken up.

It was found that such fungi were not commonly associated with disorders of birds except in thrush affections, in which the chicken, turkey, pigeon, pheasant, quail, and grouse were infected. "*Monilia albicans*, *M. krusei*, and *Oidium* sp. were the organisms frequently found in thrush affections, of which *M. albicans* and *Oidium* sp. were thought to be of etiologic importance. The avian strains of *M. albicans* were indistinguishable from a type strain derived from human source, by morphologic, biochemical, agglutination, and agglutinin absorption tests. *Oidium* sp. from birds differed from *O. lactis* in morphologic and cultural reactions. Fermentation reactions carried out under uniform conditions on a representative number of strains were found to be of value in the classification of established types. It appears that *M. albicans*, *M. parapsilosis*, and *M. krusei* can be counted among the recognized types. Agglutination tests differentiated the *M. albicans-M. candida* group from *M. parapsilosis*, *M. krusei*, and *S[accharomyces] fibuliger*. They failed to differentiate between the pathogenic *M. albicans* and the saprophytic *M. candida* type. The terminology of thrushlike affections of birds should be clarified by applying the terms 'moniliasis' and 'oidiomycosis' to disorders caused by members of the implied genera."

A list of 44 references to the literature is included.

Parasites of fur-bearing animals, R. G. LAW and A. H. KENNEDY (*Ontario Dept. Game and Fisheries Bul. 4 (1932), pp. 30, figs. 17*).—This is a brief account of the more important endoparasites of fur-bearing animals.

Hookworm infection in foxes, R. G. LAW (*Ontario Dept. Game and Fisheries Bul. 5 (1933), pp. 39, figs. 8*).—This is a digest of the present knowledge of hookworm (*Uncinaria stenocephala* Rail.) applicable to its control, together with work by the author presented in connection with a four-page list of references to the literature.

The author reports that Ontario foxes are frequently infected with *U. stenocephala*, which is widespread throughout the Province. "A study of the life cycle of *U. stenocephala* reveals no essential differences between it and other species of hookworms previously described in the literature. Direct centrifugal flotation is the most accurate technic as yet devised for diagnosing the presence of eggs in fox feces. The Willis technic has a distinct place in the veterinary field if the highest degree of accuracy is not essential. The dilution egg count technic gives with fox feces an approximate estimate of the extent of infection present. Eggs per gram of feces gives a smoother measure than egg counts per day.

"Foxes become infected with larvae either by way of the mouth or skin. It has been demonstrated that *U. stenocephala* will reach sexual maturity in foxes in 14 days. The adult worms do not inflict severe injury on the intestinal mucosa. Cellular debris forms the major portion of the food. The worm ingests the tip of the villus but does not penetrate into the submucosa. Anemia is the outstanding pathological condition found on post mortem with heavily infected foxes.

"Freezing temperatures varying from 30° to 32° F. if prolonged for 5 days have a lethal effect upon larvae in soil. Larvae placed in water are able to withstand freezing temperatures which destroy them if placed in soil. Ninety-two percent of larvae placed in moderate shade from June to the first week in October died within 3 weeks. Eight larvae survived out of 3,000 for a period of 129 days. Heavy rains apparently destroy hookworm larvae in the soil. The eggs of *U. stenocephala* hatch out larvae at temperatures varying from 30° to 37° C., but a large percentage of the larvae die within 24 hours. Temperatures varying from 20° to 25° appear to be near the optimum. Larvae hatched at 20° to 25° are very active and live in water for at least 7 months. Development of eggs ceases once the thermometer approaches the freezing point. Feces exposed to temperatures varying from 32° to 34° F. for 5 days failed to hatch out larvae when placed in the incubator at 20° to 25° C. Feces may hatch out larvae if exposed for a few hours to severe frost.

"Tetrachlorethylene in the indicated dose of 1 cc for an adult fox gave an efficiency of 81.6 percent in the treatment of a group of foxes. It required four repeated doses of tetrachlorethylene to remove all hookworms present from a group of 38 foxes. Sodium chloride solution will destroy hookworm larvae in the soil. Hookworm infection tends to disappear in a group of foxes when they are run on board floors for a period of 2 years. Pups born on board floors from infected parents are either free from hookworms or very lightly infected. Climatic conditions prevailing in Ontario have been correlated with anthelmintic treatment, and the most favorable season for treatment has been outlined."

AGRICULTURAL ENGINEERING

Report of the Chief of the Bureau of Agricultural Engineering, 1933, S. H. McCrory (*U.S. Dept. Agr., Bur. Agr. Engin. Rpt., 1933, pp. 22*).—The progress results are presented of irrigation investigations (use of water and reclamation of alkali lands); drainage investigations (hydraulic losses in bends of various shapes in pipes, run-off studies, durability of draintile, drainage of sugarcane lands and lands overlying an artesian ground-water reservoir, maintenance of drainage ditches, control of ground water in peat and muck soils, drainage index of soils, and drainage district operation); investigations in soil erosion control and farm land development; emergency conservation work; investigations in farm machinery for corn borer, pink bollworm, pecan insect, and Japanese beetle control, production of sugar beets, cotton, and corn, mechanical distribution of fertilizers, use of power and machinery on farms, artificial drying of crops, seed cleaners and scarifiers, and alcohol-gasoline fuel tests; and investigations in farm structures (including pisé de terre, use of steam for soil sterilization, and studies of the storage and transportation of potatoes and fruits) and cotton ginning.

Surface water supply of the United States, 1932, Parts 4, 5, 7, 9 (*U.S. Geol. Survey, Water-Supply Papers 729 (1933), pp. V+155, fig. 1; 730 (1933), pp. VI+206, fig. 1; 732 (1933), pp. V+132, fig. 1; 734 (1933), pp. V+137, fig. 1*).—Part 4 of this report, prepared in cooperation with the States of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Vermont, and Wisconsin, presents the measurements of flow made on streams in the St. Lawrence River Basin during the year ended September 30, 1932. Part 5, prepared in cooperation with the States of Illinois, Indiana, Minnesota, Missouri, North Dakota, and Wisconsin; part 7, prepared in cooperation with the States of Arkansas, Kansas, Missouri, New Mexico, Tennessee, and Texas; and part 9, prepared in cooperation with the States of Arizona, New Mexico, Utah, and Wyoming, present corresponding measurements for the Hudson Bay and upper Mississippi River, the lower Mississippi River, and the Colorado River Basins, respectively.

Ground-water resources of western Tennessee, F. G. Wells (*U.S. Geol. Survey, Water-Supply Paper 656 (1933), pp. VII+319, pls. 16, figs. 18*).—This report, prepared in cooperation with the Tennessee Division of Geology, deals with the ground-water resources of that part of Tennessee lying west of the northward reflex of the Tennessee River.

Analyses of samples of water taken throughout western Tennessee indicate that except for the presence of considerable iron the water is of good quality for all purposes. The waters are soft, and the total dissolved solids are usually less than 100 p.p.m. Except in a few places the water contains sufficient iron to precipitate out on standing or when the water is boiled. The iron is readily removed, however, by aeration followed by sedimentation or filtration for removal of the precipitate.

Large ground-water developments are few in western Tennessee. There are 40 public water supplies, but not more than 10 pump 500,000 gal. or more a day. Bored wells are the most numerous throughout the area, but drilled wells for domestic use are becoming more common. There are, however, very few domestic water systems.

Irrigation requirements of the arid and semiarid lands of the Pacific slope basins, S. Fortier and A. A. Young (*U.S. Dept. Agr., Tech. Bul. 379 (1933), pp. 70, figs. 6*).—This is the fifth and final report of a series dealing with the irrigation requirements of crops in the arid and semiarid lands of the Western States (E.S.R., 64, p. 269). Much of the investigational work on field crops summarized in this bulletin was conducted in cooperation with the Department of Public Works of the State of California and with the California Experiment Station.

The statistical data on irrigation of semitropical fruits and nuts in southern California were obtained mainly from studies conducted by the agricultural extension service of the University of California in cooperation with the U.S. Department of Agriculture. A large amount of data is presented and analyzed, and 32 references to literature bearing on the subject are included. An appendix gives data on irrigation water applied, rainfall, and crop yields in Oregon and California.

New type of silt sampler developed for water studies, A. H. Frazier (*Engin. News-Rec., 111 (1933), No. 17, p. 491, fig. 1*).—In a brief contribution from the U. S. Geological Survey, a silt sampler for use in connection with the determination of the silt content of streams and irrigation canals is described. This sampler consists of a standard pint milk bottle held in a 40-lb. bronze weight of streamline design, which offers a minimum resistance to the current of the water. The bottle is opened and closed by a stopper operated by small weights dropped down the suspending cable by the observer. The sampler is suspended by a cable in the same manner as a current meter. It is adapted for the collection of samples anywhere in the cross section of the stream to a depth within less than a foot from the bottom.

Soil mechanics in engineering.—I, Soil types and properties. II, Permeability. III, Consolidation, J. Mulholland (*Commonwealth Engin., 20 (1933), Nos. 7, pp. 185–192, figs. 13; 8, pp. 225–231, figs. 10; 9, pp. 259–266, figs. 13*).—This series of three articles sets forth some applications of the developing science of soil mechanics to practical problems in engineering design and construction.

In the first article, which deals with soil types and properties, examples are given of the general use of soil mechanics in engineering. The second article, dealing with the mechanics and measurement of permeability, demonstrates the importance of this feature in structures such as earth dams. The final article deals with the factors affecting the consolidation of soils and with methods for its measurement. Examples are given of the effects of consolidation of soils, and the theory of consolidation is discussed.

Some soil pressure tests, H. de B. Parsons (*Amer. Soc. Engin. Proc., 59 (1933), No. 9, pp. 1377–1388, figs. 4*).—Studies of the horizontal pressure of soils in a fill completely saturated with water are reported.

Measurements were made of the horizontal pressures on a stationary bulkhead, resulting from bank sand and bank gravel. The fills were 7 ft. deep and alternately dry, fully saturated with water, and drained. The results indicated that the horizontal pressures for a pervious soil are more dependent on the angle of internal friction than on the angle of repose. At the beginning of irrigation the pressures became less until the hydraulic pressure, due to the rising water, began to increase more than the relatively diminishing pressures from the soil.

Influence of electric current on soil firmness [trans. title], N. PUCHNER (*Fortschr. Landw.*, *8* (*1933*), *No. 17*, *pp. 385–388*, *figs. 8*).—Studies conducted at the Technical Academy of München on the influence of an electrical current at 110-v pressure on the cohesive properties of soil as they resist the passage of tillage implements through the soil are reported. The soils tested were medium and heavy clay loams, and the experimental set-up simulated an arrangement whereby the plowshare is the negative pole. A current of 0.5 a was used.

It was established that the resulting decrease in draft power requirement is not due solely to electro-endosmose but mainly to a change and reduction in internal friction of the soil. The elasticity under pressure and the cohesion of a soil mass could be markedly decreased by passage of an electric current. This effect was even more marked in the heavy loam soil than in the medium loam soil. Within the moisture content limits of from 13 to 15 percent and at a decreasing water content, there was a linear increase in the compaction of a medium loam soil under pressure. The compaction decreased from 12 to 15 percent under the influence of a current of 0.5 a at 110 v. Under the same conditions the compaction of a heavy loam soil decreased from 25 to 35 percent.

Field and laboratory verification of soil suitability, R. R. PROCTOR (*Engin. News-Rec.*, *111* (*1933*), *No. 12*, *pp. 348–351*, *figs. 4*).—Consolidation and percolation tests of foundation soils are described, and results are presented from 27 such tests on several types of soils when under loads equivalent to fills having depths of from 2 to 200 ft.

The data on percolation rates and the percentage of the soils finer than the 200-mesh screen showed that no definite relation exists between them. It is shown, however, that the extent to which the soil is compacted is much more important for obtaining watertightness than the percentage of fines.

None of the soils tested showed an excessive percolation rate, and most of the rates shown are so low that the soil may well be classed as impervious to water. The percolation rates through all soils tested are negligible when they are compacted to the condition of a minimum plasticity needle penetration resistance of 300 lb. per square inch when saturated. Any soil that meets this condition could probably be used in a dam. It is unlikely that the percolation velocity would be sufficiently high to erode any of the fines from the soil.

Some experiments in soil heating, J. E. JOHANSSON (*Jour. Min. Agr.* [*Gt. Brit.*], *39* (*1933*), *No. 12*, *pp. 1113–1116*, *pls.* [2]).—Experiments conducted at the Alnarp Horticultural Institute are reported in which comparisons were made of artificial soil heating in frames with heating by fermenting the organic material in manure and straw, by steam in clay or wood pipes, and by hot water in copper and iron pipes.

The results of the experiments indicate that both the steam and hot water systems are useful in soil heating, and one or the other may be preferable under difficult conditions.

It was found that the fuel consumption was at least a third lower for the hot water system using copper pipes, but pump operation is necessary. In steaming, the temperature can be raised in a shorter time than by hot water circulation, but the boiler needs more attention when used for steaming than for heating water. It was also found that the steam system can be used for partial sterilization of the soil, as it is possible in a rather short time to raise the soil temperature to 70° C., and even higher when the steam is injected into the pipes by nozzles of greater interior diameter.

A soil sterilizer, W. C. KRUEGER (*N.J. Agr.*, *15* (*1933*), *No. 4*, *pp. 7, 8*).—A very brief account is given of experiments on the sterilization of soil by electricity.

A new system of land cultivation (*Impl. and Mach. Rev., 59 (1933), No. 702, pp. 478–481, figs. 4*).—The Pelo Pardi system of land cultivation is briefly described, and the equipment used is illustrated.

This system is based on the principle of subdividing the land into units of cultivation, each one controlling its own regime of water. Every unit is limited by the line of impluvium and displuvium, and therefore constitutes a zone of earth having a single slope. In its turn, each unit is subdivided into smaller sections that are 10 m wide and consist of two gently sloping sides that join in the middle at the peak and at their lower ends adjoin similar subdivisions of the same unit of cultivation. All these subdivisions as a unit are in turn together surrounded by what are special types of headland, something like 5 m wide, the headlands at the top and bottom of the inclination of the unit of cultivation, and also the ones running longitudinally, having a special furrow cut between them and the unit of cultivation they surround.

The important part is that the configuration of the superstrucure is exactly reproduced in the subsoil, which is to say that the plane of the bottom of the worked earth has a course constantly parallel to that of the plane of the superstructure.

Soil-erosion control by terraces, C. E. Ramser (*Engin. News-Rec., 111 (1933), No. 15, pp. 437, 438, figs. 3*).—In a brief contribution from the U.S.D.A. Bureau of Agricultural Engineering, the results of research at the several soil erosion experimental farms on the influence of terrace slope, spacing, and length upon the waste of soil and water are summarized.

Outstanding among the results obtained on the design of terraces is the information collected on the farm at Tyler, Tex., which supports the recommendations made in 1916 that a terrace with a variable grade is more effective in controlling erosion than a terrace with uniform grade. Measurements of the discharge from two terraces 700 ft. long, one with a uniform fall of 6 in. per 100 ft., and the other with grade varying from 0 to 6 in. per 100 ft., showed that two thirds more water and one third more soil were removed from the former during the year 1931. At Bethany, Mo., the relative efficiency of variable and uniform grades was indicated by an experiment consisting of two terraces about 1,200 ft. long, one with a uniform fall of 4 in. per 100 ft. and the other with a fall varying from 0 to 4 in. per 100 ft. Nearly twice as much soil was lost from the uniform graded as from the variable graded terrace.

Public Roads, [November 1933] (*U.S. Dept. Agr., Public Roads, 14 (1933), No. 9, pp. 157–180+[2], figs. 14*).—This number of this periodical contains the current status of U. S. Public Works road construction as of October 31, 1933, and an article on Strength Tests of Cast-Iron Culvert Pipe, by E. F. Kelley and W. F. Kellermann.

The atmospheric corrosion of different kinds of iron and mild steel wire [trans. title], J. Greger (*Statens Provningsanst., Stockholm, Meddel. 58 (1933), pp. 1–12, figs. 3; Eng. abs., pp. 16, 17*).—The results of an investigation of the atmospheric corrosion of different kinds of iron and mild steel wire during long-time exposure in the open air are reported as conducted by the Swedish Government Testing Institute. The test material included 4 kinds of mild open-hearth steel, 3 kinds of mild steel from electric furnace, 4 kinds of charcoal wrought iron, and 1 kind of armco ingot iron. One of the mild open-hearth steels and one mild steel from the electric furnace contained copper. All these materials were rolled to wire of 5 mm diameter, which was then cold drawn to 3 mm in the manner used for telegraph wire. The wire rings were boiled in a 5 percent soda solution and then in water for cleansing and stabilization.

Physical tests made included tensile and torsion tests, and tests of electrical resistance. The corrosion tests included long-time field tests and short-period laboratory spray tests. In the field tests the materials were subjected to air contaminated with acid vapors and coal smoke and to sea air.

The corrosion was measured by determining the electric resistance of the wires in their original condition and after exposure during certain periods. It was determined at the beginning, after 8 months, after 2 years, and after 4 years.

In the field tests corrosion was greatest in air contaminated with acid vapors and coal smoke, and least in sea air. The two copper-bearing steels showed the least corrosion. Of the remaining kinds the two open-hearth steels of ordinary quality with ordinary amounts of carbon and other constituents showed the least corrosion. The electric furnace steels and the remaining open-hearth steel showed the greatest corrosion. The charcoal wrought irons and the armco iron showed very nearly the same corrosion and rank between the open-hearth steels of ordinary quality and the electric steels.

Corrosion tests on mild steel wire by spray method [trans. title], E. J. Virgin (*Statens Provningsanst., Stockholm, Meddel. 58 (1933), pp. 12–15; Eng. abs., pp. 17, 18*).—This is a report of the laboratory spray tests on the steels noted in the above report.

The spraying device consisted mainly of a circular disk of bakelite which was made to rotate slowly, 1 r.p.m., in a large porcelain container. Thirty test wires of 160 mm length were radially fixed on the disk. Two specimens of every one of the 15 kinds of wire were thus tested simultaneously. A 3 percent NaCl solution was used. The spray was so arranged that only the mist reached the specimens. During the rotation of the disk the specimens were continuously revolved one fifth revolution for each revolution of the disk. The specimens were sprayed twice daily, generally for 10 or 20 minutes from Monday to Friday and were allowed to dry on Saturday and Sunday. The test was continued during 46 days. The specimens were then cleaned by cathodic treatment in a 10 percent KCN solution, examined and weighed. The loss of weight averaged about 5.5 percent.

A comparison of the results of the long-time field tests and of the spray tests shows that the corrosion results in the more rapid laboratory salt spray test on different kinds of iron and mild steel wire do not correspond to the relative atmospheric corrosion of the same wires under actual working conditions.

The efficiency of surface treatments on the permeability of concrete, G. W. Washa (*Jour. Amer. Concrete Inst., 5 (1933), No. 1, pp. 1–8, figs. 3*).—The results of tests conducted at the University of Wisconsin are reported in which an effort was made to ascertain the merits of some of the commonly used surface waterproofing compounds.

The treatments were divided into seven different classes including (1) treatments consisting of water solutions of inorganic salts which react chemically with the constituents in the concrete with a subsequent deposition of insoluble material in the pores of the concrete; (2) water suspensions of substances or mixtures of substances of a pore-filling character or which react chemically with each other or with constituents in the concrete and form pore-filling compounds; (3) soaps; (4) combinations of solutions, in two or more applications, which react chemically with each other in the pores of the concrete, filling them with substances of a water repellent or insoluble nature; (5) solutions of liquid and solid hydrocarbons consisting of heavy petroleum distillates such as lubricating oil or paraffin dissolved in volatile solvents such as gasoline, the solid matter being deposited in the pores of the concrete upon evaporation of the solvent; (6) bituminous coatings and membranous systems which tend to produce films or membranes over the surface of the concrete; and (7) miscellaneous washes and cement grouts.

The use of surface treatments to obtain lower leakages through concrete was more or less beneficial in all cases. The value of the various treatments, however, varied widely, with some treatments giving an efficiency of around 40 percent and others giving efficiencies very close to 90 percent. The efficiency of the treatment depended upon the compound used and also on the method of application. That is, a compound properly applied and giving good results might give very poor results if improperly applied. Also the efficiency is dependent more on the individual treatment used than on any class of treatment.

Some of the more effective types of treatments according to these tests are 1:1 grout properly cured, Minwax, 1:2 grout properly cured, neat cement properly cured, plain asphalt emulsion, Glidden, Sika grouts, Por-seal "A", casein, and sodium silicate. The rate of leakage through the specimen for the 20- to 50-hour period is practically the same as the rate for the 40- to 50-hour period.

If cement grouts are to be used they should be moist cured for at least a week to obtain the best results. Tests showed that the efficiency of a 1:1 grout was reduced from 88 to 45 percent by decreasing the moist curing period from 7 to 0 days. The 1:1 grout cured for 7 days gave an efficiency of 88 percent, which was the best of any of the grouts tested. With the leaner 1:2 grout the efficiency was 72 percent, and with neat cement it was only 65 percent.

Exposure to the elements decreased the efficiency of all treatments tested with the exception of the sodium sulfate plus barium chloride treatment. The decrease in efficiency caused by an exposure of two years varied from 5 to about 80 percent, based on original efficiency. The treatment which was an exception to the general trend increased its efficiency about 70 percent, also based on original efficiency.

Effectiveness of paints in retarding moisture absorption by wood, F. L. Browne (*Indus. and Engin. Chem., 25 (1933), No. 8, pp. 835–842, figs. 2*).—Studies conducted by the U.S.D.A. Forest Products Laboratory of the protection against moisture afforded woods by coatings of primers and paints are reported. Coated and uncoated wood specimens, in equilibrium with 65 percent relative humidity, were weighed before and after exposure for one week to 97 percent relative humidity. The effectiveness of protection was studied for primers alone, primers covered with two coats of white lead-linseed oil paint, and three similar coats of many paints, including aluminum paints, white paints, colored paints, paints containing varnish vehicles, paints containing different concentrations of pigment, and paints applied by brush and by spray gun.

It was found that paint primers, whether made with granular pigments or with aluminum powder, rarely afford wood much protection against moisture movement. As a rule the major portion of the protection offered by a paint coating is attained when the second coat of paint is applied. As a primer alone, aluminum paint is sometimes less effective against moisture movement than a granular pigment paint made with the same vehicle, yet when a second and a third coat of ordinary paint are applied over the two primers the coating built upon the aluminum primer proves more effective than the one built upon the granular pigment primer. Primers highly effective against moisture movement can be made with aluminum powder, provided a finely divided grade of powder is used in a special varnish vehicle. Highly effective primers can also be made with granular pigments and varnish vehicles, but it is not known whether such primers will retard flaking of aged coatings from summer wood as well as aluminum primer does.

A hypothesis of wood priming is advanced according to which a good primer is one that contains enough pigment in suitable form to exert a capillary competition with the wood for the paint vehicle in order to restrain penetration of liquid into the wood and to permit top coats to harden with a continuous matrix that renders them nonporous with respect to moisture-laden air or liquid water. Apparently spray-applied primers on wood are somewhat less effective against moisture movement than brush-applied primers. Thinning aluminum primer for spray application seems to be undesirable.

Permeability of paint films to moisture, R. I. Wray and A. R. Van Vorst (*Indus. and Engin. Chem., 25 (1933), No. 8, pp. 842–846, figs. 4*).—Various methods for determining the permeability of paint films to moisture are discussed, and results obtained by three methods are given. More fundamental information is obtained from the method which measures the permeability of paint films alone without reference to any base material. Tests on wood, however, have certain advantages which should not be overlooked. In general, aluminum paint coatings show greater resistance to the passage of moisture than other pigments in the same vehicles. The moisture resistance of the vehicle is an important factor in determining the permeability. The aluminum powder concentration in the vehicle and the grade of powder used also have a marked effect upon the permeability of the paint.

Higher powder content, within limits, and finer grades of powder make more impermeable paint films.

Explosives and agriculture [trans title], A. Piédallu (*Ann. Agron. [Paris], n.ser., 2 (1932), No. 3, pp. 384–396, figs. 4*).—Experiences on the use of explosives for stone and boulder removal, hardpan breaking, drainage, tree planting, and the like are described briefly. The author points out that nitrate explosives only should be used for agricultural blasting. A variable mixture of trinitrophenol, nitronaphthaline, and trinitrotoluene is considered to be the best agricultural explosive in that it has both a physical and a chemical effect on the soil. It liberates carbon monoxide which destroys animal life in the soil, and also liberates oxygen which stimulates nitrification.

Diagram representing the real phenomena of compression, combustion, and expansion in high speed motors [trans. title], A. Grebel (*Compt. Rend. Acad. Sci. [Paris], 195 (1932), No. 25, pp. 1230–1232, fig. 1*).—Diagrams are given using the coordinates pressure and time. These are considered to be more suitable than the pressure volume coordinates for representing the effects due to the delayed starting of the initial ignition which decides the ultimate performance, the presence or absence of knock, and the thermodynamic efficiency of the engine.

Measurement of speed of heat production in the cycle of an internal-combustion engine by use of indicator diagrams [trans. title], T. Te-Lou (*Compt. Rend. Acad. Sci. [Paris], 196 (1933), No. 5, pp. 329–332, fig. 1*).—In experiments on the phenomena of the development of active combustion in an internal-combustion engine, graphic data are deduced showing the variation of the ratio of heat production to time, thus giving the speed of contribution of heat in the cycle. The curve at first increases rapidly, then flattens out, and finally decreases rapidly.

It was found that the speed of flame propagation in the engine is proportional to the speed of the engine, which was varied from 500 to 1,250 r.p.m. in the experiments. This is attributed to the increase in turbulence of the gas as the engine speed increases.

Absorption spectra of gaseous charges in a gasoline engine, L. Withrow and G. M. Rassweiler (*Indus. and Engin. Chem., 25 (1933), No. 8, pp. 923–931,* *figs. 9*).—An apparatus is described that photographs absorption spectra of the gases within an internal-combustion engine running under its own power. A number of typical spectra taken under various engine conditions and with several different fuels are presented. The absorption spectra show that under some engine conditions chemical changes occur in the fuel-air mixtures prior to inflammation. Such changes are greater in degree or different in nature in knocking than in nonknocking combustion. The facts established by this work support the idea that knock is due to spontaneous ignition ahead of the normal flame fronts.

Localization of the phenomenon of detonation [trans. title], M. Serruys (*Compt. Rend. Acad. Sci.* [*Paris*], *195* (*1932*), *No. 26, pp. 1376–1379, figs. 3*).—Experiments are reported, the purpose of which was to determine the actual seat of detonation. An air-cooled engine was equipped with 17 thermo-electric couples in the wall for this purpose.

It was found that in the presence of detonation the temperature rises at certain points more than 100° C., while at other points the increase is not more than 20°. In the absence of detonation this variation in temperature is not observed. Photographs and diagrams of the ends of pistons show erosion and fractures which occur in the regions of abnormal temperature increases. The conclusion is drawn that these points are the actual locations where detonation occurs.

Determination of some physical characteristics of detonation [trans. title], M. Serruys (*Compt. Rend. Acad. Sci.* [*Paris*], *195* (*1932*), *No. 25, pp. 1228–1230, fig. 1*).—The conclusion is drawn that detonation is a local phenomenon of duration between 1/10000 and 1/20000 second, and is produced at the end of combustion when nearly all the available heat has been utilized. The findings indicate that pressures which double or treble the normal may accompany detonation, according to its intensity, and may even exceed 100 kg per square centimeter (about 1,420 lb. per square inch).

Gasoline engines and knock testing, R. Stansfield (*Jour. Inst. Petroleum Technol.*, *19* (*1933*), *No. 117, pp. 567–573*).—A brief summary is given of progress in the development of automotive internal-combustion engines and of knock testing, using the C.F.R. technic.

Effect of ozone on engine knock (*Jour. Franklin Inst.*, *216* (*1933*), *No. 4, pp. 535, 536*).—It is briefly reported by the U.S. Department of Commerce Bureau of Standards that ozone has been found to be more potent in causing detonation, or fuel knock, than tetraethyl lead is in suppressing it. As little as 0.002 percent will cause an increase in detonation equal to that occasioned by substituting regular gasoline for premium gasoline. By using somewhat higher concentrations—up to 0.01 percent—regular and premium gasolines were made to knock as badly as does kerosene. These concentrations of ozone, however, had no effect on power or efficiency when the compression of the engine was such that no detonation occurred.

Comparative fuel economy with gasoline and with alcohol-gasoline blends (*Jour. Franklin Inst.*, *216* (*1933*), *No. 4, pp. 533–535*).—Studies conducted by the U.S. Department of Commerce Bureau of Standards are reported briefly. The results showed that when a 10 percent blend of absolute alcohol with gasoline is substituted for the same gasoline without alcohol, without any change in carburetor adjustment, there is on the average no significant change in the miles per gallon under normal operating conditions and in the absence of vaporization in the fuel lines. If vaporization is occurring, as often is the case in hot weather, the fuel consumption will tend to increase more rapidly with the alcohol blend than with the gasoline.

The substitution of the 10 percent alcohol blend, under the above conditions, on the average results in a small loss in acceleration or get-away. In order to restore the acceleration to that obtained with gasoline, a different carburetor adjustment must be made for the alcohol blend, and when this adjustment is made the alcohol blend gives on the average 4 percent less miles per gallon than the gasoline.

Lubricants and lubrication, A. R. Bowen (*Jour. Inst. Petroleum Technol., 19 (1933), No. 117, pp. 578–591*).—In a contribution from the University of Birmingham, England, a brief review is presented of the advances made recently in the development of lubricants and lubrication practices.

Thin film lubrication of journal bearings, M. D. Hersey (*Jour. Wash. Acad. Sci., 23 (1933), No. 6, pp. 297–305*).—A mathematical analysis of thin film lubrication is presented, with particular reference to factors affecting the determination of the coefficient of friction. The application of a dimensional theory is demonstrated.

Lubricating oils with colloidal admixtures [trans. title], O. Steinitz (*Allg. Oel u. Fett Ztg., 29 (1932), No. 1, pp. 35–37*).—The author summarizes experiments by himself and others to show that the addition of colloidal graphite to lubricating oils improved the properties of the oils to decrease friction and heating in journal bearings. Oil utilization was also decreased. When used in an internal-combustion engine, the graphited oil improved acceleration and decreased friction, heating, and oil utilization.

Graphited lubricants (*U.S. Dept. Com., Bur. Standards Letter Circ. 387 (1933), pp. 3*).—Practical information is given on the value of lubricants containing graphite in internal-combustion engines. It is pointed out that the action of graphite in oil usually is to lower the viscosity, thus lowering the friction. It appears, therefore, that the lowering of friction is not due to the graphite itself but to the lowered viscosity. The same effect could be secured by using lower viscosity oil. Apparently the main advantage of using graphited lubricants is in engines with worn and scored friction parts.

Apparatus for determining load-carrying capacity of extreme-pressure lubricants, S. A. McKee, F. G. Bitner, and T. R. McKee (*S.A.E. [Soc. Automotive Engin.] Jour., 33 (1933), No. 6, pp. 402–408, figs. 8*).—In a contribution from the Bureau of Standards, U.S. Department of Commerce, an apparatus for determining the load-carrying capacity of extreme-pressure lubricants is described and illustrated, and results of tests with this apparatus are presented and discussed. The results are taken to indicate that in a given mechanism operating under extreme-pressure conditions and lubricated with an extreme-pressure lubricant, the factors involved are such that the relative load-carrying capacities for various lubricants under specified conditions of operation do not necessarily apply to all operating conditions. They indicate also that among the factors of significance are speed of rubbing, lubricant temperature, and rate of loading.

The operating characteristics of the machine used are such that automatic alignment is maintained between the two rotating test rolls, so that the applied load is a true criterion of the actual pressure on the rubbing surfaces. The point at which lubrication fails is quite definite and may be readily determined while the machine is in operation.

Over the operating range covered, the test results obtained with this machine appear to rate the lubricants in reasonable agreement with ratings based upon service performance in automotive gears. While these tests do not cover the entire range of variations in the various factors involved, it is believed that the results obtained are sufficiently promising to justify cooperative work on the study of the load-carrying capacity of extreme-pressure lubricants in machines of the same fundamental design.

Comparison of methanol and other anti-freeze agents, T. C. ALBIN (*Chem. and Metall. Engin., 40 (1933), No. 10, pp. 526, 527, figs. 2*).—Data are reported graphically showing the important relationship of methanol to ethyl alcohol with reference to antifreezing properties, and to acetone, the common impurity in wood methanol. It is shown that for all concentrations up to that giving about —25° F. as a freezing point, the vapor concentration of methanol is less than that of ethyl alcohol for a given amount of protection. However, with concentrations below that affording —5° freezing point, the actual boiling point of the methyl alcohol is higher. At greater concentrations the ethyl alcohol has the higher boiling point.

Specifications for methanol antifreeze stock before adding diluting water or color safeguards are proposed.

Preliminary conditions to the introduction of machinery on American and German farms, C. H. DENCKER and N. L. WALLEM (*Vorbedingungen des Maschineneinsatzes auf amerikanischen und deutschen Betrieben. Berlin: Paul Parey, 1932, pp. 91, figs. 85*).—This is an extended account of an automobile survey of mechanized agriculture in the United States made by the authors in 1931. A study was made of different important farming practices and the machinery used therein, and of the reasons for using machines for the different purposes. Observations were made in 22 States.

Special attention was given to power sources, including tractors and trucks, and to power machinery for land preparation, cultivation, planting, fertilization, spraying, and harvesting; feed grinding and shredding machinery; irrigation pumping; and use of electricity in agriculture.

Utilization and cost of power on Corn Belt farms, L. A. REYNOLDSON, W. R. HUMPHRIES, S. R. SPEELMAN, E. W. McCOMAS, and W. H. YOUNGMAN (*U.S. Dept. Agr., Tech. Bul. 384 (1933), pp. 60, figs. 12*).—The information forming the basis of this bulletin was obtained in the fall and winter of 1929–30. It represents a cooperative investigation between the Bureaus of Agricultural Economics, Agricultural Engineering, and Animal Industry, and the Indiana, Iowa, Michigan, and Missouri Experiment Stations.

Data are presented on the use and cost of power on 736 farms in 11 areas in Michigan, Indiana, Illinois, Iowa, and Missouri. The total number comprised 280 ordinary tractor farms on which a conventional noncultivating type of 2- or 3-plow tractor was owned, 79 general-purpose tractor farms, 343 ordinary horse farms, and 34 big-team-hitch farms. The big-team-hitch farms averaged 286 and the ordinary horse farms 179 acres, with 252 and 137 acres of crop land, respectively.

Average annual usage, including small amounts of hired power, on the ordinary tractor farms was 315 tractor hours and 3,885 horse hours per farm, on the general-purpose-tractor farms 488 tractor hours and 2,856 horse hours per farm, on the ordinary horse farms 17 tractor hours and 4,163 horse hours per farm, and on the big-team-hitch farms 34 tractor hours and 8,219 horse hours per farm.

Tractor usage on the home farm averaged per year 471 hours for the general-purpose tractors, 301 hours for the 2-plow tractors, and 297 hours for the 3-plow tractors. Seventy-three percent of the general-purpose tractors were used in cultivating row crops. Fifty-eight percent of all the tractors performed custom work, of which two thirds in time was belt work.

Work-stock usage on the home farm averaged 736 hours per head on the big-team-hitch farms, 688 hours on the ordinary horse farms, 681 hours on the

3-plow-tractor farms, 643 hours on the 2-plow-tractor farms, and 641 hours on the general-purpose-tractor farms per year.

The average period of use of the tractors, up to the time of the survey, was 4.3 years for the 3-plow tractors, 3.8 years for the 2-plow tractors, and 2.0 years for the general-purpose tractors. The total useful life of the tractors was estimated most commonly by the users as 10 years.

The total costs per hour of operation in 1929, omitting wages of the operator, were $1.13 for the 3-plow, 80 c. for the 2-plow, and 61 c. for the general-purpose tractors. The fixed charges of depreciation and interest on investment were 51 percent for the 2- and 3-plow tractors and 45 percent for the general-purpose tractors. At prices of fuel, oil, and labor prevailing during the year ended June 30, 1932, the hourly costs, omitting operator's wages, would have been lower by about 10 percent for the 3-plow tractors, 12 percent for the 2-plow tractors, and 14 percent for the general-purpose tractors.

For all classes of farms the average cost per crop acre, exclusive of operator labor, was lowest in 1929 on the general-purpose-tractor farms at $2.91, and at 1931–32 prices appeared lowest on the big-team-hitch farms at $1.74.

Corn grown in the ordinary way showed a lower cost per acre for labor and power when husked with a 2-row picker than when harvested by any other method observed. Oats showed the lowest cost per acre for labor and power in growing and harvesting when seeded with an end-gate seeder. The requirements and costs for wheat were but slightly different from those for oats handled in the same way. Hay cost less for labor and power when loaded with a loader from the windrow than when loaded from the swath or by hand from the windrow.

Built in auxiliary motors in mowing machines [trans. title], K. Kermann, F. Abel, M. Koswig, and Dietrich (*Schr. Reichskurator. Tech. Landw., No. 40 (1933), pp. 112, figs. 30*).—Practical information is given on the use of auxiliary engines on binders and mowers, with particular reference to the resulting economic benefits. An appendix gives technical data on the adaptation, attachment, and use of auxiliary engines.

The mowing of lodged grain [trans. title], W. Mertens (*Schr. Reichskurator. Tech. Landw., No. 44 (1933), pp. 44, figs. 30*).—Attachments to mowers and binders for facilitating the mowing of lodged grain are described and illustrated.

Feed hoppers and troughs (*Mass. State Col. Ext. Leaflet 76, rev. (1929), folder, figs. 2*).—Drawings and a bill of of materials are presented.

The design, construction, and testing of cream separators [trans. title], W. Fritz and U. Mennicke (*Schr. Reichskurator. Tech. Landw., No. 34 (1932), pp. 54, figs. 83*).—The first part of this publication discusses the important technical features involved in the construction of cream separators. The second part is a mathematical analysis of the process of cream separation as it occurs in the modern cream separator. The third part relates to the testing of the mathematical formulas underlying the design of cream separators as a basis for a standard testing procedure to determine the separating efficiences of cream separators.

Design of circular tanks, E. Cowan (*Concrete [Chicago], Cement Mill Ed., 41 (1933), No. 11, p. 16, fig. 1*).—An alignment chart is given, devised to facilitate computations for reinforcing steel in circular concrete bins for grain storage.

Thermal insulation, E. Griffiths (*Inst. Chem. Engin. [London], Trans., 10 (1932), pp. 35–41, figs. 7*).—Studies of the thermal conductivity of some of the materials used for insulating purposes are reported, and descriptions of the apparatus used for testing wall sections and materials of coarse structure, materials used in refrigeration, and refractory materials are included.

The results for the different materials are presented in tabular form.

Insulation for house construction, J. D. Hoffman (*Purdue Univ., Engin. Ext. Ser. No. 31 (1933), pp. 31, figs. 19*).—Technical information is given on the computation and installation of house insulation.

Construction and operation of mechanical refrigerators for farms, J. R. Tavernetti (*California Sta. Circ. 329 (1933), pp. 35, figs. 17*).—This circular reports the results of investigations which have been conducted by the station in cooperation with the California Committee on the Relation of Electricity to Agriculture. It presents information of both a practical and technical character on the construction and operation of large mechanical refrigerators for farms.

Sewage disposal on the farm, M. C. Burt (*Farming in So. Africa, 8 (1933), No. 90, pp. 349, 350, figs. 4*).—Practical information is given on the planning and installation of small sewage disposal systems adaptable to farms in South Africa. The systems described consist of septic tank and tile absorption areas for effluent disposal. The paper is a contribution from the Stellenbosch-Elsenburg College of Agriculture.

Sewage disposal, W. Rudolfs (*N.J. Agr., 15 (1933), No. 3, pp. 7, 8*).—Very general and brief information is given on the use of sewage gas as a source of power for heating and pumping. Experiments with a plant treating the sewage from a population of 7,000 people was found to produce an average of 5,600 cu. ft. of gas per day.

AGRICULTURAL ECONOMICS

Farm organization as affected by mechanization, E. A. Starch (*Montana Sta. Bul. 278 (1933), pp. 102, figs. 32*).—This bulletin, prepared in cooperation with the U.S.D.A. Bureau of Agricultural Economics, is based chiefly on the results of tests and experiments carried on by the departments of agricultural economics and agricultural engineering over a period of three years (1928–30) on a 3,040-acre farm near Brockton, Mont., made available by the Fairway Farms Corporation. The type of farm organization during the development period in Montana, the factors causing changes, the changes that have taken place in the agriculture of the section, and the new problems are discussed. The factors of production are evaluated, and comparison is made of such factors for 1922 and 1930. The place of and proper amount of investment in equipment, the efficient combination of land and equipment, and the effects of continuous cropping on spring plowing, two years in crop and one year fallow, alternate crop and fallow, and row-crop-wheat systems of farming are discussed. The jobs common on a wheat farm are analyzed with a view to the typical requirements and variations and their causes for the purpose of pointing out how soil conditions and implement combinations influence costs, thus making possible the determination of the most efficient power and implement combinations for any particular farm. Budgets of farm operations for tractor farms using the alternate crop and fallow system are given.

Mechanization and other changes have resulted in the quantity of labor being reduced until it constitutes only 3 to 7 percent of the total cost, in the use of machinery taking first place, in fuel and oil becoming a very large portion of the farm expenditure, and in a great reduction or elimination of horse labor. Due to climatic conditions in the area, only 75 to 90 days per season can be spent profitably in field work. Upon the basis of this time limitation and the capacities of the power units with the one-half cropped and one-half fallow system, the most efficient combinations are a 3-plow tractor and 800 acres of wheat land, a 4-plow tractor and 1,100 acres, a 6-plow tractor and 1,800 acres, and a 10-plow tractor and 3,000 acres. An average investment in equipment of approximately $5 per acre meets the requirements in the area, the exact amount varying with the size of unit.

"When spring plowing and seeding is practiced, the number of acres which can be handled in a timely manner is less than when a 3-year system of one fallow and two crops is followed. The labor distribution and utilization of equipment reaches its optimum in an alternate crop and fallow system. The costs per acre for the alternate system are also slightly less over a period of years than the costs of other systems of farming. However, the total production per acre over a long period of years is not as great as it is from the other system. Corn or other row crops may be successfully substituted for fallow. The net additional cost per acre of growing corn is approximately $3.78. A substitute feed crop makes the maintenance of livestock feasible as a side line."

The typical costs per acre of common jobs under normal conditions on level land and medium soil with labor charged at the rate of 35 c. per hour, fuel at 22 c. per gallon, and oil at 20 c. per quart were as follows: One-way disking, 53 c.; tandem disking, 52 c.; duckfooting, 43 c.; spike-tooth harrowing, 16 c.: disking and drilling, combined, 80 c.; harvesting, $1.36; picking up and threshing, $1.49: planting corn, 50 c.; plowing, $1.72; single disking, 24 c.; rod weeding, 32 c.; spring tooth harrowing, 30 c.; seeding, 37 c.; plowing and seeding, combined, $2.46; windrowing, 42 c.; mowing, 69 c.; and cultivating corn, 31 c.

The Merced Irrigation District: An economic survey of farm incomes, expenses, and tax-paying abilities, February 1933; supplemental report of farm incomes and expenses, years 1926, 1927, 1928, June 1933, M. R. Benedict (*California Sta., 1933, pp. 133, figs. 7*).—Included in this contribution from the Giannini Foundation are the two reports previously noted (E.S.R., 69, pp. 293, 881).

Type-of-farming areas in Ohio, J. H. Sitterley and J. I. Falconer (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 56 (1933), pp. [22], figs. 7*).—Maps are included and discussed showing the three type-of-farming areas of the State, the subareas of each area, and the utilization of land in 1929 and the chief sources of gross cash income in 1930 and 1931 of each area; by counties, the enterprises ranking first to fourth in the production of gross cash agricultural income in 1930 and 1931; and the percentage of farms operated by tenants, 1930. Tables show for the subareas the percentage of land in farms in different grains, hay, and pasture, the quantity of eggs and milk and number of sheep, hogs, and steers per 100 acres, value of land per acre, and population per square mile.

Trends in land use and a potential forest area in Ohio, J. H. Sitterley and J. I. Falconer (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 59 (1933), pp. [17], figs. 10*).—Maps and tables are included and discussed showing, by counties, the percentage changes, 1900–30, in total population, number of farms, land in farms, and land in crops, and the acreage of crop land harvested in 1930. Other maps show for 1929 for the southeastern part of the State (unglaciated area), by townships, the percentage of all lands in harvested crops and not utilized for any agricultural purpose.

Ohio farm land acquired by life insurance companies thru foreclosure in 1932, F. L. Morison (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 57 (1933), pp. 9, figs. 2*).—Data are given for 1932 similar to those previously noted for earlier years (E.S.R., 68, p. 546).

The agricultural situation in Ohio, as affected by a changing price level, V. R. Wertz (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 54 (1933), pp. 16, figs. 5*).—Charts and tables are included showing the wholesale prices and purchasing power of the dollar in the United States, 1910–14 to 1932; the prices received and paid for production goods and the purchasing power of the farmer's dollar in the United States and in Ohio, 1910–14 to 1932; the indexes (1910–14=100) of the purchasing power of Ohio's principal agricultural products, by years 1915–32, and of quantities of such products necessary to buy a given quantity of products used in farm production; the relation between wages and prices of farm products and wholesale prices of products other than food used in farm production, 1915–32; and the amounts and relations, by years 1920–32, of the gross and net cash incomes, interest on mortgage debt, direct taxes paid, and other cash operating expenses of Ohio agriculture.

The more general effects in the United States of the changing price level and the Ohio farm situation as regards purchasing power of products, production goods purchased, tax and interest payments, cash rents, and purchasing power of net income are discussed.

[Estimated gross cash income from the sale of agricultural products from Ohio farms, by counties], P. P. Wallrabenstein and J. I. Falconer (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Buls. 48 (1932), pp. [14]; 60 (1933), pp.* [7]).—These bulletins continue Bulletin 27, erroneously cited as Bulletin 17 in the series previously noted (E.S.R., 65, p. 385), and include tables showing, by counties, the agricultural gross cash income, total, per acre, and per farm, and the percentages of such income from the six leading sources. No. 48 covers the years 1930 and 1931 and No. 60 the year 1932.

Some factors affecting profits in sheep raising in southeastern Ohio, F. L. Morison (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 58 (1933), pp. 16, figs. 2*).—This study covers the 3-year period ended September 30, 1932, and is based on 214 flock records secured in 7 counties from typical farms on which fine-wool sheep were kept. Analysis is made and tables are included showing (1) the average annual costs, by items, and income from wool, lambs, and manure per 100 sheep; and (2) the relation of percentage of wethers kept, number of lambs raised per 100 ewes bred, weight of fleece, size of flock, and whether crossbred or fine-wool lambs were kept upon different items of costs, receipts, amount of labor required, etc. Comparison is made of the average costs, receipts, income, labor used, income from lambs and from wool, etc., on the 10 most and the 10 least profitable and all flocks.

A survey of the cost of producing market milk in the Fresno milkshed, A. Shultis (*Calif. Agr. Col. Ext. Serv., 1933, pp. 12*).—This survey was made as a contribution from the Giannini Foundation to discover the actual costs of producing market milk for the city of Fresno as a guide in setting up a marketing code or agreement with distributors in the milkshed. Data from 11 herds are analyzed to show quantities of hay, concentrates, silage, pasture, and labor used per pound of butterfat produced and the costs per pound of butter in 1933 of these items; miscellaneous costs, depreciation, and interest; and the income from the sale of cows. The method of making adjustments for changes in input costs are illustrated.

Some economic aspects of surplus control with particular reference to the summer orange industry of California, H. R. Wellman (*Calif. Agr. Col. Ext. Serv., 1933, pp. 11, fig. 1*).—This is a mimeographed preliminary report confined to an analysis of the results that would obtain from the regulation of packed-fruit shipments of California summer oranges as regards the average f.o.b. prices and the average returns per acre. Some of the findings were as follows:

Regulation of shipments as to quantity, quality, time, and place affords an immediate means of alleviating the difficulties of surplus production of California summer oranges while slower operating factors are correcting the situation. Growers controlling at least 90 percent of the production should participate in a plan for such regulation. A 20 percent reduction in 1932 in shipments to domestic markets would have resulted in about 35 percent increase in the returns per acre. Withdrawal in 1932 of all lower grade fruit smaller than 216s and all first grade fruit smaller than 288s would have given returns 5 percent higher than if the same quantity reduction had been applied proportionately to all grades and sizes.

An analysis of the operations of the Escondido Valley Poultry Association, E. A. Stokdyk (*California Sta., 1933, pp. 34, figs. 2.*).—This is a mimeographed report of the study made by the Giannini Foundation to determine what changes, if any, in the cooperative purchasing of feeds and the handling of poultry products in the Escondido Valley might result in higher net incomes to members of cooperative associations in the area.

The Agricultural Adjustment Act applied to cotton (*Washington: Govt., 1933, pp. [4]*).—This is a brief statement of the plan announced by the Agricultural Adjustment Administration "under which the cotton grower will offer to retire a part of his present crop from production."

A balanced harvest, H. A. Wallace (*U.S. Dept. Agr., Agr. Adjust. Admin., 1933, pp. II+12, figs. 3*).—Included are the plan for applying the Agricultural Adjustment Act to the 1933, 1934, and 1935 wheat crops, approved by the President of the United States on June 16, 1933; an article by the Secretary of Agriculture entitled A Balanced Harvest; and a statement to American wheat growers entitled What the Farm Act Offers You.

Handbook of organization and instructions (*U.S. Dept. Agr., Agr. Adjust. Admin., Wheat Sect., 1933, pp. V+73, figs. 2*).—"This handbook of organization describes the manner in which the Government and producers jointly plan to meet the problems of ever-recurring wheat surpluses and their attendant economic and social ills." The official statement of the Wheat Adjustment Plan, issued June 16, 1933, by the Agricultural Adjustment Administration of the Department with the approval of the President of the United States, is given. The economic position of wheat and the economics and major provisions of the Wheat Adjustment Plan are discussed. The determination of the "domestic taxable consumption percentage" and the determination of allotments to individual farms are described and illustrated. The steps in organization and carrying out of the educational campaign, of the organization campaign for the semilegal community machinery through which the provisions of the Wheat Adjustment Plan will apply to producers, and of the permanent county wheat production control associations are outlined.

Appendixes include copies of various forms, among which are the application for and the wheat allotment contract and articles of association for a wheat production control association.

Farm-property taxation in Maine, C. H. Merchant and M. S. Parsons (*Maine Sta. Bul. 366 (1933), pp. 223–285, figs. 15*).—The author presents results of a survey of the farm tax situation covering the principal types of farming in the State—apple, blueberry, dairy, potato, and poultry.

The general property tax in the State represents approximately three fourths of the farmers' entire tax burden. The State real-estate tax in 1931 was two and one half times that of 1913. Though a slight decline took place in 1932, farm prices were extremely low while the farm taxes were extremely high. The average tax levied on apple farms included in the study during 1924 to 1926 amounted to 20.52 percent of the farm income; on blueberry farms in

1926, to 10.83 percent; on dairy farms in 1927, to 15.82 percent; on potato farms in Aroostook County for the 3-year period 1928–30, to 12.54 percent; on potato farms in central Maine for the years 1929–30, to 8.58 percent; and on poultry farms in 1930, to 8.46 percent. The average tax on the 422 farms included in this study amounted to 12.70 percent of the farm income.

Many inequalities were found to exist in the assessment of farm property, both real and personal. Large farms were assessed relatively less than small farms.

The tax on real and personal property for the year 1932 amounted to $28,300,785. Of this amount 21.1 millions were local taxes, 1.6 millions county taxes, and 5.7 millions State taxes. Drastic reductions in the State property tax would obviously relieve property owners very little. The desire of the public for more and better governmental services, especially in schools and roads, accounts for a large proportion of the farmers' tax burdens.

It is pointed out that many towns are too small for maximum efficiency in government, and the suggestion is made that local units be consolidated for purposes of increased efficiency.

Our system of public finance and the services of government, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 52 (1933), pp. 61, figs. 4*).—This bulletin, prepared in cooperation with the U.S. Department of Agriculture and the agricultural extension service of Ohio State University, describes and discusses the fiscal systems of the United States, the State of Ohio, and the counties, townships, and school districts of that State. Tables and charts show the organization of the administrative units and the revenue receipts from different sources and the expenditures for different purposes in the different units. Principles relating to taxation and the civil service and elections in Ohio are discussed.

Receipts and expenditures of county and township governments, 1931, J. F. Dowler (*Ohio State Univ., Dept. Rural Econ. [Mimeogr. Bul. 55] (1932), pp. [40]*).—Tables show, by counties, for 1931 the county receipts from different taxes, fees, fines, and commercial and other sources; the county expenditures for different items of government, protection, health, highways, charities and correction, education, etc.; and the receipts from different sources and expenditures for different purposes of townships.

Motor truck transportation in western South Dakota, F. T. Hady (*South Dakota Sta. Circ. 11 (1933), pp. 38, figs. 4*).—Part 1, growth of trucking, discusses the increase in the number and size of trucks in the following counties: Butte, Haakon, Harding, Jackson, Jones, Mellette, Perkins, Tripp, and Ziebach. It is based on the records of the South Dakota Motor Vehicle Commission and material gathered from county treasurers of most of the counties. Part 2, trucking of grain in the Philip area, is based on the records of the Farmers Union Marketing Association of that centrally located town in Haakon County. It discusses the weight of loads, distances hauled, and the agencies hauling grain. Part 3, commercial hauling, covers the nine counties and is based on data obtained from the records of the South Dakota Railroad Commission. It describes the State regulations of motor vehicle carriers and the growth and progress of this type of transportation and discusses the earnings, by quarters 1925–29, and the business mortality of commercial truckers, by counties, and the taxes paid by such truckers in 1929. An appendix discusses the Motor Carrier Act of 1933 and its effect on the problems dealt with in the study.

The number of trucks in the nine counties increased 291 percent from 1923 to 1930, as compared with 138 percent for the State as a whole. There was 1 truck for about every 10 farms in 1925 and 1 for every 5 farms in

1930. During the period the percentage of trucks of less than 2 tons decreased, while that for those of over 2 tons increased.

In the Philip area the average haul was over 26 miles, that of greatest frequency being from 31 to 35 miles. The most frequent size of load was from 3,600 to 4,100 lb. Farmers owning the grain hauled about 60 percent of it, commercial truckers 22 percent, and others 18 percent. There was no commercial hauling over 45 miles, due to the rates being over 24 c. per hundredweight.

In 1925 there were 14 truckers with permits, and as late as 1926 only 3 counties reported any gross earnings tax from trucking. During the period 1925–30, 382 truckers started business and 244 dropped out, leaving only 138 at the end of the study. The average quarterly tax paid by 180 truckers during the 5-year period was $7.11, which capitalized at 3 percent gave an average quarterly gross income of $237.16 per trucker. Commercial trucking was commonly engaged in as a side-line business. While there was no clear-cut relationship between length of time in the business and earnings, there was an indication that the older established business had the larger earnings.

Farm produce received in trucks in the Columbus wholesale market, 1932, C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 62 (1933), pp. [1]+22, figs. 6*).—This is a continuation of the series previously noted (E.S.R., 68, p. 548).

Car-lot shipments of fruits and vegetables from stations in the United States for the calendar years 1930 and 1931, compiled by L. Norgren (*U.S. Dept. Agr., Statis. Bul. 42 (1933), pp. 151*).—This bulletin, which supplements that previously noted (E.S.R., 66, p, 789), is based on information secured by the market news service of the Bureau of Agricultural Economics. Tables are included showing, by years 1922–31, the total United States car-lot shipments of different fruits, melons, and vegetables; the combined shipments from different States; the approximate shipping season of different fresh fruits, melons, and vegetables, by State of origin; the imports of certain fruits and vegetables in 1930 and 1931, by country of origin; and the car-lot shipments of different fruits and vegetables during the calendar years 1930 and 1931, by State, county, and shipping point.

Marketing Tokay grapes, E. A. Stokdyk (*California Sta. Bul. 558 (1933), pp. 74, figs. 11*).—This study, a contribution from the Giannini Foundation, was made "to determine what changes in the relations between growers and marketing agencies might be made to increase the net returns to Tokay grape growers." Data are included and discussed regarding acreage, production, annual and seasonal shipments and prices, the distribution to auction and private sale markets, and marketing costs. The trade channels, trade relations of growers, shippers, distributors, etc., the Tokay clearing house operated in 1932, and the shipment restriction program during that year are also described and discussed.

There were approximately 30,000 acres of Tokay grapes in California with a production of nearly 154,000 tons in 1930. The acreage has remained practically stationary since 1925, but about 12 percent is not yet in full bearing. During the period 1921–32 annual interstate shipments fluctuated between 3,982 and 7,456 carloads and delivered auction prices per package from $2.10 in 1921 to $1.11 in 1932. The principal factors affecting annual prices of Tokay grapes were the volume of interstate shipments, the volume of interstate shipments of other California table grapes, and changes in the general price level. A change of 1,000 carloads in Tokay shipments influenced Tokay prices approximately 16 c. per package, a change of 1,000 carloads in other California grape shipments influenced Tokay prices between 4 and 5 c. per package, and a 5-point change in the all-commodity index of wholesale prices affected Tokay prices nearly 10 c. per package. Volume of interstate shipments of Tokay grapes and the prevailing prices of other California grapes were the principal factors affecting weekly Tokay prices in each of the principal auction markets.

Charts show the market capacity, 1929–31, of each of the 11 auction markets at different prices and changes in such capacity, 1929–31 and 1932, in the New York, Chicago, Boston, and Philadelphia markets. Mondays and Fridays were the days of strongest demand in the New York market. Average marketing costs, 1925–32, for sales in wholesale markets east of the Rocky Mountains ranged from 84.4 c. per package in 1932 to 91.1 c. in 1926, a fluctuation of approximately 8 percent as compared with a fluctuation of more than 43 percent in delivered selling prices.

The outstanding problems of the industry indicated by the study were (1) how to restrict the volume marketed in years of large crops or low consumer purchasing power or both, and (2) distribution of the supply among the principal market areas so as to maintain equal pressure on all in order to receive the highest total returns with a given volume marketed. As to reduction of acreage, the author states "if it were certain that consumer purchasing power would remain at 1932–33 levels for several years, the immediate removal of enough vines to reduce production to a point where all of the supplies could be marketed at reasonable prices would be the most economical procedure. It is believed, however, that the purchasing power of consumers will increase within a few years as it has done following previous periods of depression; consequently, the removal of a large number of vines to meet present conditions is not economical."

The establishment of two organizations, one composed of growers and one of shippers with a third agency to coordinate the activities of these two organizations when mutual problems arise, is recommended. A possible set-up for the two organizations and coordinating agency is outlined.

Dairy marketing information on Ohio markets, 1933: Dairy marketing associations, some changes and developments, P. A. Young (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 63 (1933), pp. 48, figs. 2*).—The information previously noted (E.S.R., 68, p. 551) is brought up to date and the market plans used in Ohio discussed. The work was done in cooperation with the Extension Service, U.S.D.A., and the agricultural extension service of the university.

Organization and operation of barter associations in California, E. W. Braun (*Calif. Agr. Col. Ext. Serv., 1933, pp. 10*).—This is a series of 20 questions and answers designed by the Giannini Foundation to assist rural communities in organizing and operating barter associations.

British preference for Empire wheat, A. E. Taylor (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 10 (1933), No. 1, pp. [2]+33*).—Since November 17, 1932, a duty of 2s. per quarter has been levied against British imports of wheat from non-Empire countries, while Empire wheat has been imported duty-free. The conclusion is deemed warranted that a preferential duty of that amount will by no means reserve the British markets for Empire wheat. Except in cases of extraordinary gluts in Australia and Canada, or of exceptional shortage in Argentina, Argentine wheat will continue to hold its position in the United Kingdom. Russian wheat freely available for export will enter duty-paid in substantial quantities. Incidental exports, such as white wheat from Baltic Germany and soft red wheat and flour from France, will hardly find the British duty formidable. This duty, however, will probably keep out or greatly restrain imports of American wheat and flour other than that from the Pacific Northwest. Canada has been given preference over the United States in respect to hard wheat and Australia has been given preference over the United States in respect to soft wheat, but they have not been given effective preference over Argentina and Russia. If such preference is really to be claimed by the Dominions and granted by the United Kingdom, a much higher rate of duty will need to be established.

Annual index numbers of farm prices, California, 1910–1932: A preliminary report, June 1933, H. L. Stover (*California Sta., 1933, pp. 9, figs. 2*).—This is a preliminary mimeographed report from the Giannini Foundation. The index number series is of the weighted aggregative type, including 35 commodities from which 85 to 90 percent of the gross cash income of the farmers of California is derived. Tables and charts show the annual farm prices, by crop years (July to June) for each of the 35 commodities for the years 1910–31; the annual index numbers of such prices for all products, all livestock and livestock products, meat animals, dairy products, poultry products, all crops, grains, field crops other than grains, and fruits; and the annual index numbers of United States farm prices, 1910–31, by years beginning July 1 (July 1910–June 1915=100) for all products, meat animals, dairy products, poultry products, grains, fruits and vegetables, and cotton and cottonseed.

RURAL SOCIOLOGY

American agricultural villages: 1930, I. Lorge (*Amer. Statis. Assoc. Monog. No. 1 (1933), pp. [5]+III+133*).—This study was designed as a contribution to the demography of American agricultural villages. Detailed population data collected in the census of 1930 are presented for 177 representative agricultural incorporated villages that are farmers' service station towns. These data, heretofore unpublished, were compiled in connection with a study of rural social change made jointly by the Institute of Social and Religious Research and the President's Research Committee on Social Trends. The 1930 data are compared with similar data compiled in 1925 based on population data collected during the 1920 census. Tables are inserted giving the 1920–30 document comparisons for regional totals and for the entire sample.

The villages selected for study in 1925 were believed to be representative villages in agricultural areas. Nonagricultural villages were purposely excluded. The findings of this study, therefore, can only be generalized for the universe of American agricultural villages to the degree that the sampling was unbiased and for all the villages of the United States.

Within the scope of the sampling, agricultural villages in 1930 showed the following differences from their status in 1920: In 1930 agricultural villagers represented an older population, a larger proportion of which was married. The population was more literate and attended school to a considerably greater degree than was the case in 1920. Occupationally, the villagers found principal employment in four major industry categories—manufacturing, trade or merchandising, agriculture, and transportation, in that order. Merchandising made the largest proportional gain. There were fewer very young and very old males gainfully employed. There had been a consistent increase, however, in the number of gainfully employed females except in the early age brackets.

Virginia county conditions and trends of social significance, W. E. Garnett and A. C. Seymour (*Virginia Sta. Bul. 291 (1933), pp. 149, figs. 131*).—This study was undertaken with a view of securing needed information concerning the factors and forces molding community, county, and State life;

of the interrelationship of such factors and forces; and of the significant trends in regard to each.

Social forces discussed include the natural resources; the people, including density and growth, rural-urban trends, and employment status of agricultural workers; agricultural conditions and trends, including land utilization, size of farms, crop trends, livestock and livestock products, farm property values and debts, and farm income; standards of living, including the farm's contribution to family living, and home conditions and conveniences; market and trade relationships; transportation facilities; educational conditions and trends, including school attendance, length of terms and illiteracy, high school and vocational training, financial factors, and reading; health and public welfare; church conditions; organizations; government, wealth, debt, and taxation, including revenue bases, expenditures and debts, and voting; and manufacturing.

"It is pointed out that after the long period of exhaustion and recuperation from Civil War ravages, Virginia has in recent years made rapid strides in many directions"; yet "many of our figures and tables show deplorable lags and shortcomings" which retard social progress.

The libraries of South Carolina, M. E. Frayser (*South Carolina Sta. Bul. 292* (*1933*), *pp. 38, figs. 7*).—This study was designed to serve as a basis for constructive legislation providing adequate public library facilities and services in South Carolina. Many of the libraries of the State were found to be inadequately supported and administered, poorly distributed, and their circulation low. Of the total State population, 39.6 percent was served by libraries, but of the rural population, only 25 percent, while of the urban population 94 percent was served. Recommendations are made for means of bringing about the improvements desired.

FOODS—HUMAN NUTRITION

[Food and nutrition studies at the Bureau of Home Economics] (*U.S. Dept. Agr., Bur. Home Econ. Rpt., 1933, pp. 2–7*).—Included in this report are summaries of studies dealing with the distribution of vitamins B and G in cereal products and green and bleached lettuce, the vitamin A content of a recently developed yellow potato which is a cross between a yellow-fleshed potato obtained in Costa Rica and a white potato, the toxicity for rats of cereal grains containing minute amounts of selenium, the comparative flavor and creaming volume of various commercial cooking fats, factors affecting the shrinkage and cooking time of roast lamb and mutton, a comparison of the constant temperature and initial searing methods for the roasting of beef ribs, legs of lamb, and loin of pork, the relative thickening quality of starches and eggs, and miscellaneous food utilization and food preservation studies.

The Food and Drugs Act (*U.S. Dept. Agr., Food and Drug Admin. Rpt., 1933, pp. 2–13*).—This summary of the work of the year in the enforcement of the Federal Food and Drugs Act includes among other items a discussion of the extent and types of food adulterations involving public health discovered and prosecuted (including spray residues), food adulterations involving filth and decomposition, and food violations involving cheats.

The new pure food and drugs bill (*U.S. Dept. Agr., Food and Drug Admin. Rpt., 1933, pp. 13–16*).—The principal new features in S. 1944 are discussed.

Meats and meat food products (*U.S. Dept. Agr., Bur. Anim. Indus. Rpt., 1933, p. 16*).—This progress report includes a summary of a study on the influence of various factors on the activity of proteolytic enzymes in the ripening of meats and meat products and on the vitamin G content of beef and pork hearts.

How to cook salt pork (*U.S. Dept. Agr., Bur. Home Econ., 1933, p. 1*).—This printed sheet of recipes for the utilization of the emergency relief salt pork has been prepared by the Bureau of Home Economics, U.S.D.A., in cooperation with the Federal Emergency Relief Administration.

The use of wheat germ as a human food, J. A. LeClerc and L. H. Bailey (*U.S. Dept. Agr., Bur. Chem. and Soils, [1933], pp. 3*).—A mimeographed summary of information.

The nutritive value of the banana, W. H. Eddy (*New York: Bur. Pubs., Teachers Col., Columbia Univ., 1933, pp. 37, figs. 4*).—This compilation of information on the chemical composition and nutritive value of the banana includes reports of original investigations conducted under the auspices of the author, many of which have been noted from other sources (E.S.R., 56, p. 894; 58, pp. 387, 689; 66, p. 192; 70, p. 273), and a summary of other studies reported in the literature. New material is included on the vitamin content of the banana in the form of fresh pulp and spray-dried powder. Unit values reported are for vitamin A fresh pulp 70 and spray-dried powder 280 units per ounce, for vitamin B_1 fresh pulp from 3 to 14 and spray-dried powder from 12 to 56, and for vitamin G about 9 units per ounce of fresh pulp.

A bibliography of 67 titles is appended.

Papaya and Papain: A list of references, compiled by V. A. Pease (*U.S. Dept. Agr., Bur. Chem. and Soils, [1933], pp. 9*).—This chronological list of references includes one of date 1756, 5 from 1878 to 1900, and 81 from 1901 to 1933, inclusive.

The value of types of dextrose in the preservation of fruits and vegetables, M. B. Van Arsdale and W. H. Eddy (*New York: Bur. Pubs., Teachers Col., Columbia Univ., 1933, pp. 24*).—This publication reports an experimental study from the laboratories of experimental cookery and of physiological chemistry in Teachers College, Columbia University, on the use of varying proportions of sucrose and corn sirup or cereloses in the canning of fruits and vegetables and the preparation of jams and jellies. Products were first judged for acceptability by the cookery staff, after which a group of the acceptable products were judged for appearance, consistency, and flavor by several "domestic science experts", and finally ratings of several products were made by a selected committee.

Of the vegetables, corn did not blend well with any sugar except sucrose, while tomatoes, peas, beets, and carrots gave satisfactory packs with cereloses and corn sirup in combination with cane sugar. In the canned fruits and jams and jellies satisfactory results were also obtained with certain proportions of the various sugars, the most satisfactory ratio of corn sugar to cane sugar varying with the material. Tomato juice blended well with the corn sugars alone as the sweetening agent.

In some instances the products with mixtures of cane sugars and corn sugars proved more acceptable than with cane sugar alone through reduction in sweetness and change in consistency.

[Frozen-pack investigations in the Bureau of Plant Industry] (*U.S. Dept. Agr., Bur. Plant Indus. Rpt., 1933, p. 6*).—This progress report summarizes studies dealing with optimum temperatures for freezing fruits in small and large containers, the varietal differences in fruits with respect to suitability for frozen-pack storage, and types of containers most suitable for preventing spoilage in frozen-pack foods.

Selected bibliography on metallic contamination of foods, with special reference to containers and cooking utensils, compiled by V. A. Pease and

R. A. OSBORN (*U.S. Dept. Agr., Bur. Chem. and Soils, 1933, pp. 27*).—"The accompanying list of references on the metallic contamination of foods is restricted to the chemical effect of food on the utensil in which it is prepared or the container in which it is stored, which results in off color, off flavor, or corrosion. No attempt has been made to follow the pharmacology of the subject, which is a field in itself, with a literature of its own." The references are arranged chronologically under the headings general, aluminum, cadmium, copper, enameled ware, lead, nickel, stainless steel, tin and tin plate, and zinc. Antimony, chromium, lacquer, nickel, silver, and sulfur are included under the proper general headings.

Selected references on iodine, 1914–1932, compiled by V. A. PEASE (*U.S. Dept. Agr., Bur. Chem. and Soils, 1933, pp.* [18]).—The references given are listed chronologically under the following headings: The iodine content of foods, water, and soil; iodine in feeds and fertilizers as a means of increasing the iodine content in human food; and iodine determination.

Chemical composition of bones of vegetarian and omnivorous rats, S. WAN (*Chinese Jour. Physiol., 7 (1933), No. 1, pp. 23–34*).—No significant differences were found in the ash, CO_2, Ca, and P values of the bones of rats fed the omnivorous and vegetarian diets described in previous papers by Wu and Chen (E.S.R., 62, p. 91).

Growth and retentions of calcium, phosphorus, and nitrogen of infants fed evaporated milk, P. C. JEANS and G. STEARNS (*Amer. Jour. Diseases Children, 46 (1933), No. 1, pp. 69–89, figs. 17*).—In this investigation, in which the authors had the technical assistance of E. A. Goff, J. B. McKinley, and M. J. Oelke, the actual retentions of calcium, phosphorus, and nitrogen were determined for periods of from 18 to 48 weeks on 9 healthy male infants fed a mixture of equal parts of evaporated milk and 12 percent corn sirup acidified with lactic acid and with orange juice, cod-liver oil, egg yolk, and vegetables fed in addition at suitable ages.

Growth in height and weight exceeded the standard rates of growth and the rate of growth of the average male infant of Iowa. During the early weeks there were clinical evidences of moderate overfeeding. After this the retentions of nitrogen, calcium, and phosphorus were high and approximately the same as those reported by Nelson (E.S.R., 67, p. 340) for undiluted acidified fresh milk. "From the data presented, it is concluded that evaporated milk, when used with the dietary supplements given in this investigation, is a good food for infants. From the standpoint of permitting good growth and high retentions of nitrogen, calcium, and phosphorus, evaporated milk compares favorably with fresh milk given with the same dietary supplements."

Calcium and phosphorus metabolism of normal pre-school children, I, II, T. PORTER-LEVIN (*Jour. Amer. Dietet. Assoc., 8 (1933), No. 6, pp. 482–488; 9 (1933), No. 1, pp. 22–35, figs. 2*).—This investigation is reported in two papers as follows:

I. *On diets containing plain and irradiated cereals.*—Two healthy children, a boy 4 and a girl 2½ years of age, served as subjects in two series of metabolism experiments, the first of short and the second of longer duration. The diets furnished approximately 50 mg each of calcium and phosphorus per kilogram per day and differed only in the cereals, which furnished approximately 10 percent of the dry weight of the diet and were nonirradiated and irradiated in successive periods. In the first study, divided into four 5-day periods, a preliminary and a test period on nonirradiated and two test periods on irradiated cereals, the entire schedule being repeated three times, the mineral retention showed no improvement on the irradiated cereal diet. In the second study the nonirradiated cereals were fed for 48 days, with two experimental periods of 5 days at the end of 15 and 23 days, and the irradiated cereals for 39 days, with experimental periods at the end of 14 and 15 days. In this part of the experiment the average retentions per kilogram per day were 0.004 and 0.007 g on the plain cereal and 0.013 and 0.01 g on the irradiated cereals for calcium and phosphorus, respectively.

Although at first sight this would seem to indicate higher retentions of these elements on irradiated than on nonirradiated cereals, the fact that the variations in retention from period to period were as great as the average increase on the irradiated cereals led the author to conclude that a further study of successive mineral balances should be made in order to determine the extent of the normal or expected variations. Such a study is reported in the following paper:

II. *Successive balance studies showing the range of variation in calcium and phosphorus storage.*—The subjects in this study consisted of a boy 2 years 7 months old and 2 girls 4 years 8 months and 5 years 6 months old. Successive 3-day balance periods were begun on February 2, 1932, and continued for 20 periods in the case of the older girl, 17 for the boy, and 6 for the younger girl. After preliminary trials and adjustments the same 3-day meal schedule was repeated, with constant intakes throughout the entire period. The diets furnished approximately 1 g each of calcium and phosphorus per day.

The daily average retentions for the three subjects in order of increasing age were 0.14, 0.13, and 0.11 g of calcium and 0.16, 0.13, and 0.14 g of phosphorus, respectively. In grams per kilogram the average retentions were, in the same order, 0.009, 0.007, and 0.005 g of calcium and 0.01, 0.007, and 0.006 g of phosphorus per day. As in the previous study, the range of variations in retention from period to period was wide. For calcium the ranges were 240, 160, and 190 mg in total retention and 17, 9, and 8 mg on a per kilogram basis. For phosphorus the corresponding figures were 110, 90, and 180 mg for the total retention and 8, 5, and 8 mg per kilogram of body weight. The extreme fluctuations in calcium retention per kilogram of body weight in the earlier study were 12 mg on plain cereal, 17 on irradiated cereal, and 17 on adequate mixed diet, with parallel fluctuations in phosphorus retention.

From an inspection of the various levels of storage of calcium and phosphorus in the present study and statistical treatment of the data in the two longer series of retentions, it was found that from 5 to 7 balances, or from 15 to 21 consecutive days, were required before the range of variations was included. It is noted that this period is considerably longer than has commonly been considered necessary for mineral balance studies on children. An examination of similar data reported by Sherman and Hawley (E.S.R., 48, p. 463) showed equally wide variations, and this was also true of a more recent study reported by Boldt, Brahm, and Andresen on the mineral metabolism of two healthy infants on breast and cow's milk over a period of approximately 90 days.

Studies on magnesium deficiency in animals.—III, Chemical changes in the blood following magnesium deprivation, H. D. Kruse, E. R. Orent, and E. V. McCollum (*Jour. Biol. Chem., 100 (1933), No. 3, pp. 603–643, figs. 3*).—In this continuation of the investigation noted previously (E.S.R., 68, p. 701), analyses were made of weekly samples of blood from dogs restricted to a ration containing only 1.8 p.p.m. of magnesium but adequate amounts of other constituents. The most significant changes in blood composition are summarized as follows:

"First, there is an early and progressive decrease in the magnesium content of the serum. Shortly thereafter there is a marked increase in total cholesterol with a commensurate decrease in fatty acids, so that the total fat remains constant. Since the increase in total cholesterol is due preponderantly to the mounting values for the cholesterol ester fraction, the percentage of total cholesterol in the ester form becomes strikingly high. These changes prevail until death. Terminally the nonprotein nitrogen rises. No other blood constituents undergo alteration."

The lowered concentration of magnesium is thought to be the factor responsible for the tetany, while the lipid changes are taken as indication of nutritive failure on the low magnesium diet.

Attention is called to the reports by Sjollema (E.S.R., 63, p. 480) on a bovine disease termed grass tetany or grass staggers occurring in the spring during the first two weeks after the fresh cows have been sent to pasture. The evidence reported is thought to suggest the probability that this condition is the result of deprivation of magnesium and calcium.

Hemoglobin content of the blood of infants, C. A. Elvehjem, W. H. Peterson, and D. R. Mendenhall (*Amer. Jour. Diseases Children, 46 (1933), No. 1, pp. 105–112, figs. 3*).—From 2,000 hemoglobin determinations on 750 healthy children varying in age from birth to 5 years, a hemoglobin curve has been plotted with age in weeks as abscissas and grams of hemoglobin in 100 cc of blood as ordinates. The curve shows a rapid fall from an average of 22 g at birth to 11.7 at from 8 to 12 weeks, a slight rise between the ages of 12 and 24 weeks, followed by a slight decrease with values remaining between 11 and 12 g until about 2½ years of age, after which it rose gradually.

A similar curve for a special group of children receiving milk supplemented with orange juice at 1 month, egg yolk at 3, cereal at 4, and vegetables at 6 months showed no significant differences from the composite curve during the first 6 months of life. Beyond this period the values were higher than those of the composite curve, thus showing the effect of additional iron in the supplementary foods.

A study of the food habits and health of farm families in Tompkins County, New York, N. B. Morey (*[New York] Cornell Sta. Bul. 563 (1933), pp. 83, figs. 19*).—This report is based on records of food habits and health of 208 farm families studied in the houshold management survey noted previously (E.S.R., 65, p. 795), together with records for 365 additional families in three other townships of the same county. Records in terms of servings were secured of all foods eaten by each member of the family on a single day. The data on health included weight in relation to normal for height and age, occurrence of constipation and frequency of taking remedies for it, number and severity of colds, occurrence of certain symptoms of "indigestion", and number of teeth lost, filled, or in need of filling. For the school children, school examination records were used.

In order to determine the relation of sex and age to food habits, the members of the families were grouped as operators, homemakers, men 70 years and over, women 70 years and over, boys 10 to 19, girls 10 to 19, boys under 10, and girls under 10 years of age. Tabulated data are given of the percentages of these groups eating specified amounts (servings but not actual quantities) of different foods in one day and the average number of servings eaten in one day by the different groups. Each of the different food groups is then discussed separately with reference to quantities and kinds consumed, some of the data being subjected to statistical analysis.

The adequacy of the diets was tested by a study of the average diet for each group and by the use of a score card for the various food groups, and a comparison was made of these two methods of judging adequacy of the diet. According to the picture furnished by the average diets of the different age and sex groups, the average consumption of meat, eggs, and milk appeared to be sufficient to provide adequate protein of good quality and adequate phosphorus. The milk consumption was considered sufficient for ordinary needs but not for pregnancy and lactation. The diets were considered adequate as regards vitamins A, B, and C and energy, but questionable as regards iron and vitamin D. The optimum score for the diets was 20, with 4 each for milk, fruit, vegetables, meat and eggs, and whole grain cereals or bread. The diets most frequently scored from 9 to 11. The optimum score for milk and for meat and eggs was not uncommon, but was rare for vegetables and whole cereals. "The coefficients for the correlation between total scores and group scores were in no instance outstandingly high. In the case of the operators, milk and fruit scores fluctuated more nearly with total scores than did any other groups of foods. In the case of the children, scores for meat and eggs and for fruit fluctuated more nearly with total scores than did other groups of foods. However, one would not be justified in concluding that a good practice in regard to any one food means a good total diet."

Other points considered in the analysis of the diets were "digestibility", this term being discussed from the "point of view of the comfort or discomfort of the person who eats the food", the quality of the diets of the children in the study as compared with those reported for other sections of the country, refusals of food in the family diet, food consumption and financial standing, association of different foods in the diets, and relation between adequacy and digestibility of the diets.

Considerable space is given to the comparison of the health data obtained with the dietary habits. Among the points emphasized are the following: "Farm life seemed to be less healthful for the women than for the men. Constipation, 'indigestion', overweight, and loss of teeth were all found to be more frequent among the homemakers than among the operators. The greater deterioration of the teeth of the women between the ages of 20 and 45 years, as compared with the men of these ages, testified that the diet of the women was not adequate to protect them from drains on calcium reserves during reproduction and lactation."

The data obtained on the dietary habits and health of the children taken in conjunction with previous studies "point to the conclusion that there is an association between the use of milk and the quality of the teeth of children. There was less uniformity of the findings in regard to the relationships between the quality of the diet as a whole and weight, or between the quality of the diet as a whole and the total number of health defects."

Additional data pertinent to the study are reported in an appendix.

The basal metabolism of American-born Chinese girls, F. G. BENEDICT and M. H. MEYER (*Chinese Jour. Physiol., 7 (1933), No. 1, pp. 45–59*).—In this contribution to the extensive series of racial studies on metabolism carried on under the auspices of the nutrition laboratory of the Carnegie Institution of Washington (E.S.R., 67, p. 474), data are reported and discussed on the basal metabolism of 18 American-born Chinese girls from 12 to 22 years of age living in Boston. The average value obtained was 9.2 percent lower than that of American girl scouts (E.S.R., 47, p. 364) and 6.1 percent below the Aub and Du Bois standards for American girls of this age range. The pulse rates were also somewhat lower than those observed in American girls.

Taken in conjunction with the other racial studies which have been reported, these findings are thought to support the conclusion that the existence of a racial factor in metabolism can no longer be doubted, and that "Chinese and Japanese, even though American-born, subsisting in part on American food, and living in large part a modern American life, have a metabolism somewhat lower than Caucasians."

The standard metabolism of the Australian aborigines, C. S. HICKS and R. F. MATTERS (*Aust. Jour. Expt. Biol. and Med. Sci., 11 (1933), No. 3, pp. 177–183*).—In contrast with low values obtained in a previous study conducted in hot weather of the basal metabolism of Australian aboriginals (E.S.R., 65, p. 892), the values obtained in the present study conducted during very cold weather (—2° to 10° C.) on unclothed natives were exceptionally high, ranging from 23 to 90 percent above the predicted values. The high values are thought to be the result of increased heat production under the atmospheric conditions prevailing. Some very low body temperatures and pulse respiration rates were noted. Direct measurements of the surface area of six of the subjects gave results agreeing to within 5 percent of values calculated by the DuBois formula.

Feeding students a low cost diet in a university cafeteria, F. QUAST and H. STRAND (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 1, pp. 36–40*).—The plan described, which has been in operation at the cafeteria at Syracuse University since September 1932, provides for three meals a day for 6 days a week at a daily cost of 58 c. per person. It is noted that only 50 percent of this cost is available for food, the rest going to operating expenses of the cafeteria. No choice is given in the food, but anyone is allowed to return to the counter for more bread, butter, and milk. Sample menus are given for a week, together with the calculated cost and distribution of food essentials in the diet for a single day and the percentage of these essentials in the menus given.

Soy bean flour in infant feeding: A study of the relation of the comparative intakes of nitrogen, calcium, and phosphorus on the excretion and retention of these elements by infants, G. STEARNS (*Amer. Jour. Diseases Children, 46 (1933), No. 1, pp. 7–16*).—Two infants with eczema were used as subjects. One was studied for six 3-day periods during which the retentions of calcium, phosphorus, and nitrogen on three different soybean diets were compared with retentions on milk. The second was studied during two periods on one of the soybean diets. The first soybean preparation used was a commercial preparation which has been used for infant feeding in this country. The second was a modification of the first in which a more highly refined soybean flour was used, with cornstarch and butterfat replacing the barley flour and olive oil of the first. The third was identical with the first except for the substitution of dicalcium phosphate for calcium carbonate.

The relative proportions of nitrogen, calcium, and phosphorus ingested differed with the diets, the proportions on the third soybean diet approximating most closely those on a milk diet. An increase in the relative intake of nitrogen and calcium in proportion to the phosphorus, which was the case on the first two diets, resulted in an insufficient retention of phosphorus, with a very marked increase in the urinary excretion of calcium and decrease in that of phosphorus. The excessive excretion of calcium in the urine is interpreted as evidence of an absorption of calcium greatly in excess of the amount which can be deposited in bone with the limited quantity of phosphorus available. The substitution of dicalcium phosphate for calcium carbonate in the third soybean food improved the relative retention of nitrogen, calcium, and phosphorus, and this modified soybean food is recommended as a satisfactory food for infants.

"It is concluded that in the feeding of infants the relative proportions of nitrogen, calcium, and phosphorus in the diet are fully as important as the absolute intakes of these elements. From the results of this study, it is suggested that, as the relative proportions of these elements in cow's milk allow adequate retention of each, this ratio seems a safe guide to follow."

Appetite and choice of diet.—The ability of the vitamin B deficient rat to discriminate between diets containing and lacking the vitamin, L. J. Harris, J. Clay, F. J. Hargreaves, and A. Ward (*Roy. Soc.* [*London*], *Proc., Ser. B, 113* (*1933*), *No. B 781, pp. 161–190, figs. 17*).—In this attempt to determine whether or not animals given a suitable free choice of diets are able to make a satisfactory selection according to their individual nutritional needs, a series of feeding tests was conducted on rats. A moisture-free diet consisting of vitamin-free casein 20, starch or sugar 55, peanut oil 20, salt mixture 5 percent, with cod-liver oil 2 drops per rat per day, was used with and without various additions. The food mixture, which was of such consistency as not to scatter readily, was packed into narrow rather high porcelain jars, and several jars carrying different diets were placed in a row inside the cage. The jars and contents were weighed each day to determine the quantity of food eaten.

In the first series of experiments the basal diet alone, lacking in vitamin B, was offered for about 3 weeks, after which a choice of 3 diets was offered—the basal diet alone and supplemented with 5 percent Bovril (a beef extract) and 5 percent marmite, respectively. Invariably the depleted rats selected the diet containing marmite, while controls which had been on the stock diet ate all 3 diets indiscriminately until the lack of vitamin B in the mixed diet led them to go over to the marmite diet.

Following the same plan, it was shown that when a choice of diets containing increasing amounts of vitamin B was offered after depletion of vitamin B there was a decided tendency to select the diet furnishing the largest amount of the vitamin. When an additional source of vitamin B as orange juice was offered separately, as well as in the diet, the rats no longer selected the vitamin B-containing diet. When several variously flavored vitamin B-free diets were offered in addition to one containing the vitamin, the animals had difficulty in selecting the vitamin-containing diet until after a 2- or 3-day "education" period when the vitamin-containing diet was offered alone. After this education period the previously depleted rats preferred to stay on the vitamin-containing diet notwithstanding its monotony, although offered various vitamin-free diets. When educated to select a diet containing a small amount of an active vitamin B concentrate, but flavored with an inactive constituent such as Bovril, the rats continued to select the Bovril-containing diet after the vitamin B concentrate had been transferred to a diet otherwise flavored. With dietary essentials which do not produce so immediate a response after depletion, such as vitamin A, entirely negative results were obtained. Diets so constituted as to produce some immediate distasteful reaction were generally rejected.

All of these and other similar tests are thought to support the conclusion that "it is the association between the character of the food in question and an experience of the immediate response which it has evoked which enables the depleted rat to discriminate in favor of the beneficial food."

Commenting upon the human application of these findings, the authors express the opinion that "future work will show that 'experience,' as contrasted with the 'instinct' to which attention has hitherto been so largely directed, plays an important part in determining human appetite." Referring to the experiments of Davis (E.S.R., 60, p. 592) in allowing infants to select their own diets, they comment as follows:

"We believe that the idea underlying this proposal is fallacious, and that choice of diet can no more be left to instinct than can the other activities of maternity and child welfare, where until recently it was widely held that 'nature' or instinct, was a sufficiently sure guide. Judging from our experiments, as well as on general common sense grounds, it is hard to see how an infant can be expected to discover the need for a dietary constituent which although it may be without any immediate obvious effect may yet, by its continued cumulative action, be absolutely essential for its future well-being."

A practical application of some lessons of the self-selection of diet study to the feeding of children in hospitals, C. M. DAVIS (*Amer. Jour. Diseases Children, 46 (1933), No. 4, pp. 743–750*).—The author's method of self-selection of food by infants and young children (E.S.R., 60, p. 592) has been extended to the serving of meals in the orthopedic ward of the Children's Memorial Hospital, Chicago. The plan followed is described, and its advantages are summarized as "the opportunity it affords of serving a more varied diet and allowing for individual choice in foods without increase of cost, better appetites and more enjoyment of food by the children, lessened nursing time and labor spent in serving meals, lessened waste of food."

The fat-soluble vitamins: Their significance in nutrition, E. MELLANBY (*Edinb. Med. Jour., n.ser., 40 (1933), No. 4, pp. 197–222, figs. 11*).—This Cameron prize lecture, delivered before the University of Edinburgh in November 1932, summarizes concisely the literature on the relation of vitamin D to rickets and dental caries, and discusses at somewhat greater length the relationship of vitamin A to infections (particularly human infective conditions) and nervous diseases, the latter including convulsive ergotism, pellagra, lathyrism, subacute combined degeneration, and disseminated sclerosis. In the author's opinion "knowledge of the action of vitamin A both in human infection and even more so in human nervous disease (except in the specific instances mentioned) is in such an elementary state that the subjects are at present largely speculative. On the other hand, the basis of both actions is firmly based on animal experiments, and history has taught us—especially the history of the antirachitic vitamin—that evidence of this nature must be taken seriously and not denied simply because it does not cover all cases. The problem is to find out why it does not always apply. Only in this way can knowledge be advanced."

A list of 48 references to the literature is appended.

Vitamin studies on pears.—I, A determination of the amount of vitamins A and C in the Winter Nelis and the d'Anjou after prolonged storage, I. A. MANVILLE and F. G. CHUINARD (*Jour. Amer. Dietet. Assoc., 8 (1933), No. 6, pp. 504–516, figs. 3*).—In this investigation of the vitamin A and C content of two varieties of Oregon pears after prolonged storage, Anjou pears were picked on September 3–5, 1931, and Winter Nelis on October 9–11, 1931. The pears, which were from the same orchard and were picked from 3 to 4 weeks before they would have become soft on the trees, were placed in cold storage at a core temperature of 30° F. One lot of each variety was changed on March 3 and another on April 22 from this storage to a refrigerator room at an average temperature of 43°. Samples were removed daily from this room and kept in a room at a temperature of from 65° to 70° until ripened and then used for the feeding tests. The first lot was fed from March 3 to April 22 and the second from April 22 to June 26. These periods represent about 2 months for Anjou and 1 month for Winter Nelis after the usual marketing period.

In the vitamin A tests samples from the whole pear were fed young rats in quantities of 2, 4, 8, and 16 g daily mixed with the basal diet. Little, if any, protection was secured on the 2-, 4-, and 8-g amounts of Anjou and on 2 g of

Winter Nelis. On 16 g of Anjou, growth at about the Sherman unit rate was secured, while with the same amount of Winter Nelis growth was considerably above the unit rate.

In the vitamin C tests the pears were divided into inner, middle, and outer thirds for testing, and the amounts fed were increased from time to time. With each increase the amounts per 300-g guinea pig were calculated. In the tests with Anjou, 3.9 g of the inner third per 300-g body weight was protective for the first period of 30 days, after which 5, 6, 7, and 17 g were ineffective, suggesting that from 75 to 80 percent of the vitamin had disappeared on storage. Of the middle third, 6.5 g was required for the first period and 14 g was almost protective for the second. The outer third was found to be less effective, but the peel (Anjou) was more effective than the flesh. Of the peel alone, 1.5 g was protective for the first period and 3.2 g ineffective for the second. The Winter Nelis variety was throughout less potent in vitamin C than Anjou.

The data presented would seem to indicate that the pear, at least as tested under the conditions of the experiment, is a poor source of both vitamins A and C and that the C potency deteriorates rapidly on storage.

A comparison between the spectrophotometric and biological assay for the vitamin A content of fish-liver oils, M. A. Magill and W. R. Brode (*Ohio Jour. Sci., 33 (1933), No. 2, pp. 127–134, fig. 1*).—In this comparison, various commercial fish-liver oils, the vitamin A values of which had previously been determined, were tested biologically by the standardized method of spectrophotometric color analysis described previously (E.S.R., 65, p. 806).

All of the oils designated as cod-liver oils, including domestic and foreign, gave with the antimony trichloride reagent an absorption band at 608 mμ, while the halibut-liver oils, for the most part concentrates of the unsaponifiable fractions obtained from the crude oils, gave absorption bands at 622 mμ. Some of the oils in both groups gave values showing quite close agreement in the two tests, but others varied widely. In two groups of the cod-liver oils, the values by the color tests were about twice as high as by the biological test. The differences which did occur were consistent in the samples from any one laboratory, or for a given set of samples.

The authors discuss at considerable length the possible mechanism involved in the production of different absorption bands (608 and 622 mμ) in vitamin A-containing oils on the theory that vitamin A is not a definite compound, but that the physiological effect is due to any one of a series of closely related compounds which must have certain structures in common.

In the examination of one of the cod-liver oils which was highly flavored with peppermint oil, it was found that peppermint oil itself contains a color-forming compound which has to a rather marked degree the same type of chromogen as is found in certain oils known to contain vitamin A.

The vitamin A content of pimiento pepper, L. Ascham (*Georgia Sta. Bul. 177 (1933), pp. 8, fig. 1*).—This is a more detailed account of an investigation noted previously from a preliminary report (E.S.R., 69, p. 308). The dried pepper proved to be even richer in vitamin A than had been estimated from the preliminary studies, for 2 mg of the dried pod gave a growth response in rats above that of the Sherman unit. A sample of the international standard carotene was also tested in 0.001- and 0.003-mg daily amounts, with weekly gains of 2.2 and 5.1 g, respectively.

Influence of carotene on growth, xerophthalmia, colpokeratosis, and oestrum [trans. title], R. Kuhn and H. Brockmann (*Klin. Wchnschr., 12 (1933), No. 25, pp. 972, 973*).—This is a summary, with references to the literature, of an extensive series of studies conducted at the Institute of Chemistry, Heidelberg, on the chemical and physiological properties (as a source of vitamin A) of α-, β-, and γ-carotene. It is concluded that the three forms of carotene are qualitatively identical in relation to vitamin A, but that quantitatively β-carotene is twice as active as the α and γ forms. Of the β form 2.5 γ daily was found to suffice for preventing growth disturbances and xerophthalmia in young rats, and from 10 to 20 γ for preventing disturbances in oestrum. On still larger amounts, 25–30 γ daily, there was a significant storage of vitamin A in the liver.

Observations on vitamin A deficiency in dogs, A. M. Stimson and O. F. Hedley (*Pub. Health Rpts.* [*U.S.*], *48* (*1933*), *No. 17, pp. 445–449, pl. 1*).—Ten out of 12 puppies placed on a vitamin A-deficient diet of rolled oats 66, casein 10, Osborne and Mendel salt mixture 4, irradiated yeast 5, and cornstarch 15 parts developed ophthalmia, while 6 controls on an adequate stock diet showed no eye symptoms. The period at which the ophthalmia developed varied from 11 to 32 weeks in a group of 5 vigorous puppies which had been fed on a general diet for a few days before being placed on the experimental diet, and from 6 to 13 weeks in the other dogs which were less vigorous and were placed on the diet without a preliminary period on the stock diet. In all cases the ophthalmia developed very suddenly and followed the same course. In the one animal given curative treatment the response was rapid. Other symptoms were not constant and were inconclusive. Death occurred spontaneously in 8 of the 10 animals on the deficient diet.

Studies in the B vitamins, I–VI (*Amer. Jour. Physiol.*, *102* (*1932*), *No. 3, pp. 566–613, figs. 2*).—Six papers are presented.

I. *Statistical comparison of small and large litters of rats on a normal stock diet*, C. U. Moore, H. B. Plymate, B. J. Andrew, and V. White (pp. 566–572).—A statistical study of the records obtained over a period of 5 years on 1,624 young rats born on a normal stock diet is reported, with the general conclusions that the young from large litters "compare favorably in hardiness and viability with the young from small litters, and that the increased number of litter mates obtainable from large litters (up to 13 young per litter) may safely be used in controlled experimental work." Specific points concerning which no significant differences were shown between small and large litters were the strain on the lactating mothers and weight gains of the young up to weaning. The weight gains up to weaning were also essentially the same in large litters unreduced in size as in large litters reduced early in the lactation period. Increases in the size of litters were found to be accompanied by small decreases in the average birth weight of the young and by slightly higher mortality during lactation.

II. *Statistical comparison of rat litters on normal stock diets with litters on synthetic diets containing varying amounts of the vitamin B complex and combinations of B_1 and B_2*, C. U. Moore, H. B. Plymate, B. J. Andrew, and V. White (pp. 573–580).—The data reported in this statistical study during the lactation period of 2,627 young rats born to mothers on the stock diet and four synthetic diets, of which two supplied the vitamin B complex in the form of dried brewers' yeast in concentrations of 2 and 10 percent of the diet and two vitamins B_1 and B_2 in different proportions, include weight changes in the mothers during lactation, size of the litters, average birth weights, average weight gains to weaning, and mortality of the young during lactation. Comparisons were also made of the oestrus cycles of the females on the stock and experimental diets. The vitamin B_1 concentrate was prepared by extracting yellow corn meal with acid 85 percent alcohol and adsorbing it on corn dextrin and the vitamin B_2 by autoclaving a 20 percent suspension of yeast in tap water for 3 hours at 15 lb. pressure. The amounts of the various sources of the B vitamins are expressed in percentages on the basis of 10 g of the basal food per animal per day. A 10 percent concentration of any vitamin preparation thus means that 1 g of the substance or its equivalent in extract was fed daily. The two synthetic diets furnishing combinations of vitamins B_1 and B_2 contained, respectively, 10 percent B_1 plus 2 percent B_2 and 5 percent B_1 plus 10 percent B_2.

No significantly greater weight changes were noted in the females nursing litters on the diets containing 2 percent and 10 percent yeast than on the stock diet. There were significant differences in litter size (mean number of young per litter) and in the mean average birth rates between the stock and all the experimental diets, but no significant differences among the experimental diets. The average individual weight gains during the lactation period showed considerable variations with 2 percent yeast always significantly lower than the stock diet. Very high mortality rates among the young during the first 4 weeks were found on all experimental diets.

III. *Evidence of a third vitamin B factor in yeast (B_4) as shown by growth curves and clinical symptoms of first and second litter young of mothers raised on synthetic B_1 and B_2 diets*, C. U. Moore, H. B. Plymate, and B. J. Andrew (pp. 581–592).—This paper reports and discusses the results obtained on continuing into the second generation diets with varying proportions of vitamins B_1 and B_2.

Normal growth of the first litter young on the two synthetic diets containing 10 percent vitamin B_1, 2 percent vitamin B_2 and 5 percent vitamin B_1, or 10 percent vitamin B_2 could not be obtained until the portions of both vitamins were approximately doubled or when 2 percent yeast was supplied as a source of the B vitamins. Second litters could not be obtained until the mothers were supplied with 2 percent yeast for 1 month prior to impregnation, and growth of the second litters was not normal until the diet was supplemented with 2 percent yeast. The clinical symptoms occurring in the young of both the first and second litters were different from those of deficiency in either B_1 or B_2 and are described as hunched-up posture, abnormal rolling gait, greasy yellowed fur, and nasal hemorrhages. Terminal spastic paralysis occurred in some of the first litter young. Dying animals showed in some cases additional symptoms of red edematous swelling of the feet. It is noted that these symptoms are practically identical with those described by Reader (E.S.R., 64, p. 594) for vitamin B_4 deficiency.

The findings are interpreted as confirming the presence in yeast of Reader's B_4 and indicating that this factor, which is necessary for continued growth in the rat, is stored in progressively lesser amounts in mothers from stock placed on synthetic diets, first litter young, and second litter young; that more of this factor is required for reproduction than for maintenance; and that the factor is present in mothers' milk in amounts adequate for normal weight gains in the young to weaning even when the maternal diet is relatively deficient in this vitamin.

IV. *A report of litters obtained on a diet in which feces were supplied as a sole source of vitamin B*, C. U. Moore, H. B. Plymate, and V. White (pp. 593–597).—The purpose of this study was to determine if feces in the diet of rats as the sole source of vitamin B were adequate to permit growth to maturity of animals born of mothers raised on low vitamin B diets and if litters could be secured from such animals. The feces were obtained from 10 adult stock males transferred from the stock diets to one containing 0.1 g of dried brewer's yeast as the sole source of vitamin B. The experimental animals consisted of 25 mixed males and females 2 or 3 months of age born and weaned by mothers on the two diets in the previous study furnishing inadequate amounts of the B vitamins. The animals were given the usual basal vitamin B-free diet with cod-liver oil, wheat germ oil, and fresh feces [amount not stated].

Of the 25 experimental animals, 19 were still alive at the end of 8 months and 9 at the end of 10 months. From matings within the group 11 litters totaling 46 young were obtained. A statistical comparison of these litters with 189 from mothers on the stock diet and 8 from mothers transferred from the stock to the vitamin B-free diet when pregnant showed that the mean number of young per litter born on the feces diet (4) was much lower than on the stock (8.59) and on the vitamin B-free diet (7.25). The young on both the B-free and feces diet had low birth weights, 4.34 and 3.8 g, respectively, as compared with the stock, 5.27 g. The mortality of the young was 100 percent for both the B-free and feces group as compared with 4.98 percent for the stock. Most of the deaths occurred during the first week.

V. *A study of myelin degeneration in the peripheral nerves of rats as associated with low vitamin B content of diet*, C. U. Moore, H. B. Plymate, and B. J. Andrew (pp. 598–604).—A study of 1,714 slide preparations (osmic acid stains) of the peripheral nerves of 471 rats from the preceding studies of the series showed no consistent myelin degeneration characteristic of vitamin B deficiency as previously suggested (E.S.R., 58, p. 391).

VI. *Further consideration of pyloric obstruction in rats*, C. U. Moore and H. B. Plymate (pp. 605–613).—Attention is called to earlier observations of pyloric obstruction in litters of rats born on diets containing 2 percent of yeast as the sole source of the vitamin B complex. Other symptoms noted on the same diet were hemorrhages of the young and mother and a high percentage of deaths with terminal paralysis. On changing the yeast feeding to 0.2 g daily fed separately in place of 2 percent mixed with the basal food, none of these symptoms appeared. In a series of experiments extending over 14 months and using 41 females on a diet in which 1 g of autoclaved yeast was supplied daily as the source of vitamin B, only one viable litter was obtained. Three of the 4 males in this litter, but none of the 3 females, showed symptoms of gastric dilatation, which, in the opinion of the authors, was due to a condition of pylorospasm probably brought about by lack of vitamin B_1.

Adsorption of vitamin B (B_1) by plant tissues.—I, Adsorption of vitamin B (B_1) by Brassica chinensis when pickled with salt and rice bran, C. D. Miller and M. G. Abel (*Jour. Biol. Chem., 100 (1933), No. 3, pp. 731–735*).—This contribution from the Hawaii Experiment Station describes the methods followed in pickling Chinese cabbage with and without rice bran, and reports data on the vitamin B (B_1) content as determined by the method of Chase and Sherman of fresh, salt-pickled, and bran-salt-pickled Chinese cabbage. In all cases the salt and bran were removed by thorough washing before the samples were tested. Data are also reported on the H-ion concentration, as determined with the quinhydrone electrode, of extracts of the fresh, salt-pickled, and bran-salt-pickled leaves.

Of the fresh Chinese cabbage, 4.5 g daily promoted growth slightly above the standard rate during the 8-week period. Pickling the Chinese cabbage in salt for 3 days caused a loss of approximately 50 percent of its vitamin B content, while pickling in a paste of salt and rice bran increased the vitamin B content to almost four times its original value. The average pH values for the various leaf extracts were fresh 6.38, salted 4.9, and bran-salt-pickled 4.74.

Two possible explanations of the increase in vitamin B in the bran-salted cabbage are suggested: (1) That the vitamin B of the rice bran is adsorbed by the leaf tissue during the salting process, and (2) that the vitamin diffuses into the tissues of the cabbage. "Since leaf tissue has a negative charge and vitamin B is known to be a basic substance, at a pH of 4.74 conditions are ideal for adsorption of vitamin B of the bran on the leaf tissue."

The vitamin C content of commercially canned sauerkraut produced under known conditions, H. T. Parsons and C. Horn (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 8, pp. 627–638, figs. 5*).—This investigation was undertaken at the Wisconsin Experiment Station in an effort to throw some light on the wide differences in antiscorbutic potency previously observed in six brands of commercially canned sauerkraut (E.S.R., 63, p. 693). Four brands of canned sauerkraut, the vitamin C content of which had been determined for the previous year's output, were produced in four factories under known and, as nearly as possible, uniform conditions. Two brands were found to be protective against scurvy in guinea pigs in 5- and 7½-g daily doses, respectively, practically duplicating their previous antiscorbutic content. As much as a 10-g daily dose of either of the other two brands failed to give any demonstrable protection, a record inferior to previous results, although one of these poor brands was at the bottom of the former list. The differences in vitamin C content in the four brands are attributed to unidentified variations in the routine procedures of the individual plants, not controlled in the experiment.

Peptic ulcers (gastric, pyloric, and duodenal): Occurrence in guinea-pigs fed on a diet deficient in vitamin C, D. T. Smith and M. McConkey (*Arch. Int. Med., 51* (*1933*), *No. 3, pp. 413–426, figs. 6*).—During the course of an investigation of the effect of vitamin deficiencies on the production of intestinal tuberculosis in the guinea pig, it was noted that peptic ulcer was frequently associated with scorbutic lesions. This led to a study of the factor or factors responsible for the development of peptic ulcer in the guinea pig.

Routine necropsies on 1,000 guinea pigs on stock diet showed no instance of spontaneous peptic ulcer, while in 20 of 75 guinea pigs fed diets deficient in vitamin C peptic ulcers developed similar in location and gross and microscopic appearance to those observed in man. Of 80 guinea pigs fed the corresponding basal diet supplemented with vitamin C only 1 developed peptic ulcer. On diets deficient in vitamins A, B, and D, but supplying adequate vitamin C, the animals did not develop ulcers. In guinea pigs fed an adequate diet, including vitamin C, mechanical injury to the mucosa of the duodenum was followed by rapid and complete healing, while in animals on a diet deficient in vitamin C similar injury resulted in the formation of peptic ulcers.

The authors conclude that peptic ulcer in guinea pigs is caused by a partial or complete deficiency of vitamin C and suggest that an abundance of vitamin C in the diet may be of value in the treatment of peptic ulcer in man.

Effect of the conditions of storage on the vitamin D potency and on other features of codliver oil, E. J. Sheehy (*Roy. Dublin Soc. Sci. Proc., n. ser., 20* (*1933*), *No. 29, pp. 463–468*).—In a study at University College, Baile Atha Cliath (Dublin), cod-liver oil was stored in different types of containers for varying periods to determine what effects such storage would have on its vitamin content.

It was found that the vitamin D potency of a good quality sample of oil was not materially changed when stored for 16 months under the following conditions: (1) In a completely filled and sealed transparent bottle exposed to light, (2) a similar bottle kept in the dark, (3) a completely filled and sealed tin-lined metal container, and (4) a partially filled barrel. It was apparent that contact with the tin or wooden lining or with the air over partially filled containers had little effect on the vitamin D content. However, since light bleaches cod-liver oil and reduces its vitamin A content and since contact with air may increase the rate of formation of free acid, it is recommended that cod-liver oil be stored in opaque containers that are completely filled.

On the ergosterin content of various edible mushrooms in Japan, M. SUMI (*Inst. Phys. and Chem. Res. [Tokyo] Sci. Papers, 20 (1933), No. 417, pp. 254–258; also in Bul. Agr. Chem. Soc. Japan, 9 (1933), No. 4–6, pp. 69–72*).—Supplementing an earlier study (E.S.R., 59, p. 595), the author has determined the ergosterol content of various parts (flesh with peel, gills, and stem) of a Japanese edible mushroom (*Cortinellus shiitake*) in its mature state, of the same mushroom in different stages of maturity, and of several other varieties of mushrooms. In all cases the material was dried and powdered before analysis. The ergosterol content was found to decrease from gills to stem and to increase from immature to mature samples. In the different varieties the content of ergosterol ranged from 0.1 to 0.4 percent of the dried material.

Dental caries, C. F. BÖDECKER (*Jour. Amer. Dental Assoc., 20 (1933), No. 5, pp. 783–787*).—This is a summary of the evidence on which the author bases his theory (E.S.R., 67, p. 479) of a protective mechanism against dental caries situated in the dental tissues themselves. In his opinion "we must regard the enamel as a tissue closely dependent for its welfare on its physiologic connection with the body, particularly during youth. Thus dental caries will finally prove to be caused mainly by systemic disturbances."

Facts and fallacies in our concept of dental caries, R. W. BUNTING (*Jour. Amer. Dental Assoc., 20 (1933), No. 5, pp. 773–782*).—This is chiefly a further exposition (E.S.R., 64, p. 392) of the author's theory that dental caries is "a specific bacterial disease and that *B[acillus] acidophilus* is the chief etiologic agency."

Bacteriologic and immunologic studies on dental caries, P. JAY, M. CROWLEY, F. P. HADLEY, and R. W. BUNTING (*Jour. Amer. Dental Assoc., 20 (1933), No. 12, pp. 2130–2148, figs. 7*).—In this extension of the investigations under the direction of R. W. Bunting of the problem of dental caries (see above), the bacteriology and immunology of the disease have been studied from observations on the teeth of human beings and rats receiving *Bacillus acidophilus* by mouth or suitable inoculation. The results and conclusions are summarized essentially as follows:

B. acidophilus has been found to be present constantly in large numbers in active caries and only temporarily in caries-free mouths. It has been found impossible to implant known strains of *B. acidophilus* in the mouths of human beings or rats when they are immune to dental caries. *B. acidophilus* agglutinins can generally be demonstrated in the blood serum of caries-free individuals, and the titer of the blood serum of caries-susceptible persons has been raised by the intradermal inoculation of a purified *B. acidophilus* filtrate, but this was generally accompanied by abscess formation at the site of inoculation. The number of *B. acidophilus* organisms in the saliva of caries-susceptible persons was substantially reduced by rigid restriction of the carbohydrate of the diet.

The authors state that in emphasizing the bacteriological phases of their dental caries studies they do not wish to minimize the importance of nutritional and biochemical contributions to the subject, but in their opinion metabolic processes can affect the progress of dental caries only by influencing the bacterial flora of the mouth.

Raw basic feeding in the prevention and treatment of dental caries, I. N. KUGELMASS and T. B. KING (*Arch. Ped., 50 (1933), No. 5, pp. 307–322*).—Observations on the arrest of dental caries in children receiving the raw base-forming diet for anorexia previously described (E.S.R., 66, p. 589) led to a more extended study of the effect of diet on dental conditions. Determinations of the degree of dental caries were made by means of the Bodecker life caries index in children under continuous supervision for other conditions. The discussion includes observations on the relation to dental caries of race, age, oral infections, and diet.

Studies of infant dietaries led to the conclusion that while no single dietary constituent appeared as the determining factor in the development of dental caries, the acid-forming or base-forming nature of the diet was of chief importance. Quantitative dietary studies for older children indicated that high carbohydrate feeding was of significance chiefly as it resulted in a lowering of the intake of more important nutrients. Vitamin A appeared to be without effect, and vitamin B deficiency was thought to be indirectly rather than directly associated with dental caries. Few children susceptible to caries showed any striking diminution in daily vitamin C intake. In this connection the efficacy of orange juice as a protective agent is attributed more to its favorable effect on acid-base balance than to its vitamin C content. Similarly, vitamin D was considered of indirect rather than direct importance.

Children free from dental caries showed consistently a diet excessive in alkali-forming minerals. Although it was noted that children with moderate caries showed a deficiency in phosphate intake, this deficiency was evidently considered of less importance than a preponderance of acid-forming constituents. Further evidence is given which, in the opinion of the authors, confirms the belief that "dental caries is a disease of mineral metabolism particularly disturbed during the peaks of rapid growth and development of childhood.

Dietary control and etiology of dental caries, L. Schoenthal and R. H. Brodsky (*Amer. Jour. Diseases Children, 46 (1933), No. 1, pp. 91–104, figs. 3*).—Observations are reported on the dental condition during a period of approximately 13 months of 319 children from 4 to 16 years of age attending the Heckscher Foundation Dental Clinics, New York City, and receiving for the most part some dietary supplement or treatment. At the beginning of the period of observation only 1 child had no cavities or fillings, 92 had from 1 to 8, 124 from 9 to 16, and 102 over 16. Seven dietary groups were designated, a so-called good diet, the same diet plus viosterol, the same diet with irradiation of the subject, a poor diet, a poor diet plus viosterol, a poor diet plus fruits, and a poor diet plus irradiation of the subject. A statistical study of the data obtained on new caries developing during the experimental periods on these diets showed significant differences between the control group on the poor diet and the groups receiving a good diet alone and supplemented with viosterol and the poor diet supplemented with viosterol. Differences between these three groups were insignificant. "It is not possible from our data to attribute dental caries to the lack of any single dietary factor. These results, however, indicate that a well-balanced diet plays a definite role in the control of caries."

No relationship could be detected between the calcium and phosphorus level of the serum and the extent of caries, nor did breast feeding, heredity, or age appear to have any striking influence on caries. Of the factors oral hygiene, bacterial flora of the mouth, and hypoplasia of the teeth, only oral hygiene showed a possible relation to the presence of caries.

Changes in the teeth of white rats given water from a mottled enamel area compared with those produced by water containing sodium fluoride, W. H. Sebrell. H. T. Dean, E. Elvove, and R. P. Breaux (*Pub. Health Rpts. [U.S.], 48 (1933), No. 17, pp. 437–445, pls. 2, figs. 5*).—Following a brief historical review of the literature on the subject of experimental fluorosis in rats, a study is reported of the changes in appearance in the teeth of rats following the administration of a concentrate of a drinking water from an endemic mottled enamel area in South Carolina and of various synthetic drinking waters.

The drinking water from the mottled enamel area concentrated to one tenth of its volume produced changes in the incisors of young rats within 10 days from the beginning of the experiment, the teeth becoming a translucent white with the gradual development of brown striations. Comparable animals receiving distilled water or synthetic water similar to the water from the endemic area with the exception of fluorine showed no changes in the teeth. Synthetic water containing 150 p.p.m. of sodium fluoride caused a loss in the normal orange color of the incisors, followed by the appearance of irregular brown spots. Water containing 500 p.p.m. proved very toxic and produced chalky white, brittle teeth in the animals surviving the acute toxic effect.

A list of 16 references to the literature is appended.

Mottled enamel: The prevention of its further production through a change of the water supply at Oakley, Ida., F. S. McKay (*Jour. Amer. Dental Assoc., 20 (1933), No. 7, pp. 1137–1149, figs. 19*).—Final evidence, completing the proof of the causative relation between fluorine in the water supply and the occurrence of mottling of enamel in the teeth, established largely through the work of Smith and her associates at the Arizona Experiment Station (E.S.R., 68, p. 413), is furnished in this report of the condition of the teeth of children in Oakley, Idaho, subsequent to the change in the water supply of the community. It is of interest that this change was made before the relation of the fluorine content of the water to the development of mottled enamel had been established, and that the old water supply was discarded and the new one selected on dental evidence alone.

A dental examination of the children in the community in February 1925, about 10 years after the town had begun to use water from a warm spring located about 5 miles distant, showed that every child who had used the supply during the period of enamel calcification had mottled enamel of every permanent tooth. An examination by the same investigators in February 1933, 7½ years after the change in water supply to a cold spring located 3 or 4 miles from the former supply, showed mottled enamel in increasing degree with increased age of the children at the time of the change. In children in whom there had been a period of enamel development overlapping the change in water supply, many of the teeth showed a sharp line of demarcation between mottled and normal enamel. Fluorine analyses of the two water supplies showed a content of 6 p.p.m. in the water from the warm spring and of less than 0.5 p.p.m. in the new supply.

TEXTILES AND CLOTHING

[Studies in textiles and clothing at the Bureau of Home Economics] (*U.S. Dept. Agr., Bur. Home Econ. Rpt., 1933, pp. 10–13*).—This report of the work of the textiles and clothing division includes, in addition to summaries of studies noted elsewhere on cotton fabric finishing (E.S.R., 69, p. 764) and serviceability of one type of hotel table damask (see below), a summary of a study conducted in cooperation with the Bureau of Agricultural Economics on the relative durability in controlled and uniform use of sheets woven from three grades of American upland cotton, and preliminary findings in a study conducted along similar lines in cooperation with the Bureau of Animal Industry on the relative merits of different kinds of new and reworked wool from fibers of known history when woven into fabrics.

Table linen for hotel use, M. B. Hays and J. D. Guerin (*Hotel Mo., 41 (1933), No. 488, pp. 43–48, figs. 6*).—This contribution from the Bureau of Home

Economics, U.S.D.A., discusses criteria for the selection of table linen for hotel use, and reports two studies of table linen in service in a Washington, D.C., hotel. The first study consisted of an examination for areas and types of wear of small table covers and napkins which had been discarded when no longer serviceable and the second of the durability and types of wear of similar table damask from the time it was put into service until discarded.

"This study emphasizes the need for service records as a guide for further buying. It should be remembered that this type of merchandise changes from year to year, so buying by brand is not the final solution to the problem. Starting with some form of specifications, such as the Federal specification, a hotel manager can, by keeping records of service, soon set up a specification to meet his own requirements."

Neps and similar imperfections in cotton, N. L. Pearson (*U.S. Dept. Agr., Tech. Bul. 396 (1933), pp. 19, pls. 4, fig. 1*).—Small imperfections in ginned cotton lints, slivers, rovings, and yarns are classified as neps proper, fragments of seed coat (fragments of mature seeds and motes), knots formed by fibers entangled around bits of foreign matter or small seed-coat fragments, fragments of compressed brittle fiber masses, and fragments from dried diseased areas. The neps proper consist only of entangled fibers, 15 kinds being differentiated according to the type or types of fibers in the knot, which are classified as thick-walled, medium-walled, thin-walled, and fuzz fibers.

In most samples studied, thin-walled fibers entered into the most neps, thick-walled fibers into the least, and neps with medium-walled or fuzz fibers were intermediate in number. The thin-walled fiber is deemed the most important fiber type in nep formation. The proportion in which various fiber types occur on the seed and other seed cotton properties seemed to influence the number of neps developing during ginning and spinning. Neps appeared to increase during manufacture. Neps occurring in ginned cotton and those found in products of manufacturing processes did not differ essentially in composition. The fibers in neps do not seem to be entangled in any definite manner. Large neps usually are an irregular tangled mass of fibers, whereas small neps often possess a definite central knot.

HOME MANAGEMENT AND EQUIPMENT

Buying for the household as practiced by 368 farm families in New York, 1928–29, M. Fish (*[New York] Cornell Sta. Bul. 561 (1933), pp. 92, figs. 21*).—The survey method was used in this study of the purchase of specific articles of food, clothing, household furnishings, supplies, drugs, and equipment for the year ended June 30, 1929, by 368 families in four counties in western New York State, including 346 families in which both husband and wife were living and 22 consisting of one parent and children, or of brothers and sisters. For the entire group the average number of persons in the household was 4 and the average number of persons dependent on the family income for support 3.4.

The farm incomes of these families were lower than usual, but some of them had already acquired property valued at from $10,000 to $50,000. In the 240 families for whom financial records were available the average household expenditure was $927, distributed as follows: Food $317, clothing $183, house furnishings and equipment $62, heating and cooking $67, lighting $24, soaps and cleaning powders $18, tobacco $12, drugs $13, health $49, and other expenses $182.

Food and clothing items were analyzed in considerable detail with reference to the relation between total expense, capital, farm income, and size of household, number and percentage of families buying individual items with quantities bought per capita, percentage expenditures for different types of foods and articles of clothing, extent of home processing of foods and home making of clothing, extent of buying by brand, prices paid for both foods and clothing, index to all prices, relative differences in prices, and flexibility in prices.

Families who purchased the greater part of their food supply spent four times as much money per capita for food purchases as did those families who processed home-grown foods and bought mainly the staple foods. "In other words, if the homemaker is willing to spend time in processing home-grown foods in the home, more of the cash income will be available for purposes other than feeding the family. Whether a homemaker should give this time depends on the alternative opportunities that are available to her."

In regard to both foods and clothing, as well as to other commodities, the need for more quality standards and grades is emphasized. "The widest relative range in price occurred for those articles on which very little market information is available to guide the consumer in judging quality differences as expressed by price differences. For food, the widest relative range in price occurred for fruits, vegetables, and meats. The relative difference in the prices of staple foods, such as flour, coffee, and rolled oats, was definitely related to the brand name under which the food was sold. For clothing, the widest relative range occurred for the expensive items such as coats and silk and wool dresses."

The families studied were not using instalment credit to any extent to finance their purchases. When the cash was not available, they preferred to go without the commodities.

Various statistical data are reported in appendixes.

Home architecture, R. Newcomb and W. A. Foster (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. XIII+336, figs. 238*).—This is a manual of practical and semitechnical information. It contains chapters on the history of shelter, the development of the house in America, the home site, house plans and planning, materials of construction, types of house construction, interior finish, home decoration and furnishing, plumbing, heating and ventilation, lighting, mechanical household appliances, ownership v. tenancy, financing the home, why employ an architect, building the new house, remodeling the house, the apartment house, the farmhouse, and the home grounds.

MISCELLANEOUS

New Jersey Agriculture, [January–October 1933] (*N.J. Agr., 15 (1933), Nos. 1, pp. 8; 2, pp. 8; 3, pp. 8; 4, pp. 8; 5, pp. 8*).—In addition to data abstracted elsewhere in this issue, these numbers contain the following:

No. 1.—Stabilizing Potato Prices, by W. H. Martin (pp. 1, 2); [Average Cost of Producing Sweet Corn in Burlington County] (p. 4).

No. 2.—The New Jersey Land Use Conference, by J. G. Lipman (pp. 1, 2); Land Utilization, by L. L. Lee (pp. 2, 3).

No. 3.—Apple Production Costs (p. 3); Peach Hardiness, by M. A. Blake (pp. 3, 4); Rooting of Grasses, by H. B. Sprague (p. 7).

No. 4.—Doing with Less, by J. G. Lipman (p. 1); Dairy Farm Incomes, by A. G. Waller (pp. 2, 3); Onion Nutrition Studies, by L. G. Schermerhorn (pp. 5, 6); Potato Growers Adopt Marketing Plan, by W. H. Martin (pp. 6, 7); Digester Tankage, by W. C. Skelley (p. 7).

No. 5.—Some Problems in Oyster Culture, by T. C. Nelson (p. 2); Farm Incomes Studied, by A. G. Waller (p. 3) New Corn Hybrids, by H. B. Sprague (p. 8).

NOTES

Alabama College and Station.—*Alabama Farmer* notes that a soil tillage experiment station is to be established under a grant of $110,000 from the Federal Public Works Administration. A series of eight test plats separated by concrete walls is to be set up at the station, and 11 types of soil used at the outset as shipped from various States. The plats will be of a size to permit the use of ordinary field implements and so constructed as to be independent of climatic conditions. A building to house the scientific and technical equipment is to be constructed.

Robert S. Duncan, assistant county agent of Macon County, has been appointed assistant extension agricultural engineer, primarily for demonstration work in soil erosion control. Soil erosion control camps are being maintained in Etowah and Barbour Counties, and several other counties are developing special programs.

Georgia College and Station.—J. D. Watson has given to the university a tract of 609 acres, including the Watson Springs, for the purpose of establishing a research station in animal husbandry and forestry.

Paul W. Chapman has been appointed dean of the College of Agriculture, relieving H. P. Stuckey, who continues as director of the station.

Nevada Station.—An economic report on the Walker River Irrigation District has been completed by the departments of farm development and irrigation. This report outlines the present financial condition of the project and the area and productiveness of the land and estimates the earning power of the project at various price levels.

A new project has been established in the division of meteorology for the purpose of perfecting the forecasting of run-off in the Humboldt Basin of Nevada, a region of shallow snow, relatively heavy summer rains, tortuous and blocked stream channel, and alluvial soil. This project is in cooperation with the U.S. Geological Survey, the U.S.D.A. Forest Service and Weather Bureau, the Nevada State Engineer, and the Humboldt water districts.

Among the unexpected results of the pioneer work by the station is the announcement by the Missouri River Division of the Corps of Engineers, U.S. Army, of plans to establish a snow survey system in connection with the management of Fort Peck Reservoir on the upper Missouri River. The final capacity of this reservoir will be between 17,000,000 and 22,000,000 acre-feet, and the drainage area above the reservoir is approximately 58,000 square miles. The dual purpose of the reservoir is to prevent floods and heavy erosion and assure navigation. To attain both purposes, a detailed snow survey and stream flow forecast service is deemed essential. It is expected that snow survey courses will be established in at least eight tributary drainage areas. The snow survey system rivals that for Boulder Dam, but is far more complex because precipitation east of the Continental Divide is relatively copious during the period of run-off.

Office of Experiment Stations.—H. P. Barss, professor of botany and plant pathology and plant pathologist in the Oregon College and Station, has accepted an appointment as principal botanist, effective March 1, and has entered upon his duties.

EXPERIMENT STATION RECORD

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EDITORIAL

THE RETIREMENT OF DRS. TAYLOR, MARLATT, AND MARVIN

As a result of retirements for age in conformity with the provisions of the Economy Act for 1932, three important changes in the heads of Bureaus of the Federal Department of Agriculture have recently become effective. The units directly involved in the transition are the Bureau of Plant Industry, the Bureau of Entomology, and the Weather Bureau. The retiring chiefs, Drs. William A. Taylor, Charles L. Marlatt, and Charles F. Marvin, constitute a trio widely known and of long experience, and the ending of their public service and the resulting changes in leadership are matters of considerable public interest.

The retirement as Chief of the Bureau of Plant Industry of Dr. Taylor terminated a service with the Department of over 42 years. A graduate in 1888 of the Michigan Agricultural College, he had been in turn assistant pomologist, pomologist in charge of field investigations, assistant chief of the Bureau of Plant Industry, and since 1913 Chief of that Bureau. His services in these capacities were aptly characterized in an expression of appreciation by his former associates which reads in part as follows: "Life-long student of horticultural science, pioneer in broadening the field of botanical research, untiring leader, sympathetic adviser, keen and kindly critic of manuscripts, promoter of friendly cooperation, exemplar of the square deal in administration."

Dr. Taylor's retirement became effective on January 1, 1934. At that time he was succeeded by Mr Knowles A. Ryerson, since 1927 head of the Division of Foreign Plant Introduction, and he in turn by Mr. B. Y. Morrison. Following the transfer to the Bureau of Entomology of Dr. Karl F. Kellerman as head of a new Division of Plant Disease Eradication and Control, Mr. F. D. Richey, principal agronomist in the Division of Cereal Crops and Diseases, became associate chief of the Bureau of Plant Industry.

Antedating Dr. Taylor's long service by about 2 years, Dr. Marlatt also preceded him in retirement, relinquishing his duties as Chief of the Bureau of Entomology on September 30, 1933. Before coming to the Department in 1889, Dr. Marlatt, a graduate of the Kansas State Agricultural College in 1885, had served that institution for

2 years as assistant professor of entomology and horticulture. Appointed as an assistant entomologist, he became assistant chief of the Bureau of Entomology in 1894 and associate chief in 1903 and succeeded Dr. L. O. Howard as Chief in 1927. While with the Bureau, he had made important contributions on the life history, habits, and methods of controlling various important pests, particularly those of fruit trees, cereal and forage crops, stored products, and the household, and the classification of insects. Upon the enactment of the Plant Quarantine Act of 1912, he became chairman of the Federal Horticultural Board, serving in this capacity until its replacement in 1927 by the Plant Quarantine and Control Administration. Appointed Chief of that organization, he was succeeded in 1929 by Mr. Lee A. Strong, to whom on October 1, 1933, the direction of the Bureau of Entomology was also intrusted.

On January 25, 1934, Mr. Willis Ray Gregg, for nearly 17 years in charge of the Division of Aerology, was confirmed as Chief of the Weather Bureau. His predecessor, Dr. Marvin, Chief since 1913 and now in his seventy-sixth year, was continued temporarily in a research and advisory capacity which in a few months will complete a notable service for the Department of 50 years. In addition to his scientific investigations in meteorology, including mathematical and statistical studies and the designing of much standard meteorological apparatus, Dr. Marvin, to quote a recent issue of the *Bulletin of the American Meteorological Society*, met in his administration "three large tests. The first, soon after he became Chief, was to provide many meteorologists to the meteorological service of the Army and at the same time increase the service of the Weather Bureau on land and at sea to meet the demands of a feverishly active country and greatly increased marine navigation in war time. The second was to reabsorb the war meteorologists into the Bureau, to build up the weather service for peace-time aviation, and, during the prosperity years, to meet increasing demands. The third, and perhaps most difficult test, involving exceptional administrative ability, was to reduce the expenses of operating the Weather Bureau to about two thirds the former economical basis without at the same time reducing the service the Bureau was rendering to the public."

The average service with the Department of Drs. Taylor, Marlatt, and Marvin had been approximately 45 years. All had attained distinction as investigators in their respective fields before selection as administrative heads, and their average age upon relinquishing their leadership was 72 years. Their successors likewise have had considerable departmental experience and as specialists and administrators, but their average age is less than 48 years. In other words, the active leadership of the Department's activities in plant industry, entomology, and meteorology has passed to a new generation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Isomeric forms of carotene and the further purification of vitamin A, P. KARRER, O. WALKER, K. SCHÖPP, and R. MORF (*Nature* [*London*], *132* (*1933*), *No. 3322, p. 26*).—It is noted briefly that on adsorption with calcium hydroxide or calcium monoxide α-carotene can be separated from β-carotene and isolated in an absolutely pure state. When thus separated, the absorption spectrum with antimony trichloride of α-carotene gives the 590 mμ band and of β-carotene one at 540 mμ. Similarly, highly concentrated vitamin A can be further purified and separated into two fractions. The main substance, which the authors have named the β substance, shows the well-known absorption band at 328 mμ and the other smaller fraction at 270 mμ. After purification by adsorption on calcium hydroxide, the β fraction shows a band at 620 mμ and the α one at 580 mμ at first, with a later one at 620 mμ.

"The analysis of the β fraction agrees exactly with the formula $C_{20}H_{30}O$, and ozonization yields geronic acid. This fraction, therefore, represents the substance for which we proposed our vitamin A structure formula."

Chemical test for vitamin C, and the reducing substances present in tumour and other tissues, L. J. HARRIS (*Nature* [*London*], *132* (*1933*), *No. 3322, pp. 27, 28*).—Attention is called to certain considerations which must be kept in mind in interpreting the chemical test for vitamin C of titration in acid solution with 2,6-dichlorophenolindophenol. It is noted that the reagent does not possess an absolute degree of specificity, but that it is a valuable if not an infallible guide. The results with fruits and vegetables as ordinarily dealt with are considered wholly reliable. With unusual types of material, confirmation by biological tests is thought necessary.

It is noted that the positive chemical tests obtained by Birch and Dann (E.S.R., 69, p. 471) for the aqueous humor of the eye have been confirmed by biological tests, but that in attempting to confirm in a similar way the positive chemical tests for rat sarcoma tissue doubtful results have thus far been obtained.

Influence of certain agents on the lability of the 'reducing factor' (vitamin C?) in milk, A. T. R. MATTICK and S. K. KON (*Nature* [*London*], *132* (*1933*), *No. 3333, pp. 446, 447*).—Two factors affecting the vitamin C (ascorbic acid) content of milk are noted. Exposure of samples of milk in glass bottles to diffuse light was found to cause rapid destruction of the factor, while on the other hand common bacteria apparently protect it.

"It seems obvious from our experiments that any work upon the stability of the labile factor to physical and chemical agents, such as heat or oxidation, must exclude the complicating factor of destruction by light."

A summary of the isoelectric points of proteins, A. W. THOMAS (*Jour. Amer. Leather Chem. Assoc., 29* (*1934*), *No. 1, pp. 3–16*).—The author tabulates the statements of protein isoelectric points as given by various investigators, indicating in each case the method used, the source of the protein, and the investigator whose figures are given. Somewhat more than 150 references are brought together in the attached bibliography.

An evaluation of systematic and random errors in protein, moisture, and ash determinations, A. E. Treloar (*Cereal Chem., 10 (1933), No. 5, pp. 477–487, figs. 3*).—"The present study [a statistical analysis] is offered as an illustration of procedure in evaluating the systematic and random errors of a number of chemists. . . .

"While precise evaluation of random errors may be made at any time within laboratories individually, the determination of systematic errors may only be secured through cooperation between laboratories. It would appear desirable that both types of error should be checked periodically for magnitude. To facilitate this, consideration might be given to the establishment of an analytical check service, national in scope and so authoritative in its decisions as to provide a powerful force for the establishment of greater precision in important routine chemical determinations."

A method for the determination of carbohydrates in leaves, R. H. Dastur and K. M. Samant (*Indian Jour. Agr. Sci., 3 (1933), No. 3, pp. 460–477*).—The authors modified the method of Folin and Wu (E.S.R., 42, p. 712) for estimating sugars in blood. Reducing sugars were estimated accurately in concentrations of 0.001 percent. Ten percent tartaric acid was used in place of citric acid as the hydrolyzing agent for estimating cane sugar. Maltose was not found in leaves. Some sugar solutions from leaves showed a rise in the reducing power after sulfuric acid hydrolysis. This increase in reducing power may be due to the presence of gummy substances or glucosides. Starch was hydrolyzed to dextrose and maltose by taka-diastase. The maltose was then hydrolyzed by 10 percent sulfuric acid into dextrose. The value of starch was obtained by multiplying the value of dextrose obtained by 0.9.—(*Courtesy Biol. Abs.*)

A method for the continuous automatic extraction of soils, J. C. Russel (*Soil Sci., 36 (1933), No. 6, pp. 447–450, fig. 1*).—This contribution from the Nebraska Experiment Station describes a simple device capable of being set up in batteries of 12 or more and providing for the completion of the extraction with a relatively small volume of extractant. The soil sample is treated in a filter tube, between layers of quartz sand, with an upward current of the extracting reagent delivered by an automatic siphon set-up, which the author finds it usually best to adjust to a rate of flow of about 1 cc per minute.

A drawing indicates the construction of the apparatus, and tabulations of experimental data show the rate at which water-soluble and exchangeable components may be extracted. Extraction with 100 cc of water more than sufficed for the removal of the water-soluble chlorides of the 40-g samples for which the figures are given; and for the extraction of the exchangeable calcium of 20 g (air-dried) of each of three soils 375 cc of normal ammonium acetate proved sufficient.

The use of indicators for the qualitative determination of soil reaction, H. J. Harper (*Soil Sci., 36 (1933), No. 6, pp. 451–463*).—That the filtrates of diluted indicator solutions did not, after passing through various soils, give the same indication of pH value as did electrometric measurements of the pH value of suspensions of the same soils is reported from the Oklahoma Experiment Station, together with figures indicating that the "salt effect" may be a cause of the discrepancy. The addition of the indicators used brought about a reduction in the pH values of the soils, the effect being most marked in the cases of soils but slightly acid, neutral, or basic. It is also noted that "a decrease in the pH value of the soil suspension occurred when the concentration of the indicator was increased, and vice versa." These results were obtained with all except very acid soils.

Indicator absorption was greater in the cases of bromothymol blue and of bromocresol green than in those of bromocresol purple, chlorophenol red, or cresol red.

It is proposed to use bromocresol purple for classifying soils, with respect to their reaction, into five groups ranging from "5.4 and less" to "7.5 or higher"; the indicator solution being made up to contain 0.04 percent of the dye and brought to pH 6.1 with calcium hydroxide, together with 10 percent either of methyl or ethyl alcohol.

"Bromocresol purple gives sharper color changes than chlorophenol red and is recommended in preference to the latter indicator. The use of carefully neutralized indicator solutions is necessary in order to obtain accurate information."

The distillation method for determining the combined water and organic matter in soils, G. J. Bouyoucos (*Soil Sci., 36 (1933), No. 6, pp. 471–484, fig. 1*).—Further work on the author's distillation method for the determination of combined water and organic matter in soils is reported in a contribution from the Michigan Experiment Station. The original apparatus and technic (E.S.R., 68, p. 727) have been modified and improved. Data indicating the accuracy of the procedure in determining the water distilled over are presented; and it is shown that "the method also appears to be accurate in determining the organic matter content in soils. The only uncertain factor in the determination of the organic matter is whether the water yielded by the organic matter upon destructive distillation is combined water, . . . as in the inorganic soil material." Evidence to show that the water in the organic matter can be considered combined water, as in the inorganic soil material, is adduced.

A new method for estimating replaceable Na and K in soils, A. N. Puri (*Soil Sci., 36 (1933), No. 5, pp. 355–359*).—The author presents in working detail a method dependent upon the use of barium hydroxide as a replacing reagent. The sodium and potassium are thus made to appear in the leachings as their hydroxides, and are determined by the titration of their carbonates after the calcium and barium have been removed by precipitation with carbon dioxide.

"Chlorides to the extent of 10 percent in the soil have no effect on the determination; but if sulfates are present they should be determined separately by shaking the soil with NaCl solution, allowing it to settle, and estimating the sulfates in an aliquot of the supernatant liquid. An amount of $BaCl_2$ equivalent to the sulfate determined is then added to the soil. The Na_2SO_4 is thus converted into NaCl, and the soil is treated with 0.2 N $Ba(OH)_2$ as usual. Since Na_2SO_4 is quantitatively converted into insoluble $BaSO_4$ and soluble NaOH on the addition of $Ba(OH)_2$, an amount equivalent to the sulfate present can be subtracted from the exchangeable Na obtained. If the soil contains appreciable amounts of $CaSO_4$, however, the addition of $BaCl_2$ is the safest course."

The measurement of color in flour and bread by means of Maxwell discs, J. C. Baker, H. K. Parker, and F. B. Freese (*Cereal Chem., 10 (1933), No. 5, pp. 437–446, figs. 6*).—The authors propose reading the color of flours in terms of red, yellow, black, and white by comparing spinning disks of the flour sample with a disk made up of sectors of adjustable angular magnitude, adjusting the proportion of each component of the standard color until a match is obtained, and reading the proportions of the components by means of a scale applied to the circumference of the standard disk. The following form a part of the observations recorded:

The proportion of yellow did not vary with the grade, but was reduced by bleaching and still more by light petroleum extraction. The red was least in patent flours, and was less affected either by bleaching or by light petroleum extraction than was the yellow. This difference between the behavior of the red and that of the yellow components was especially marked in hard wheat patent flours.

Neither yellow nor white was found to correlate with the ash content. There was found some degree of correlation between the red and the black color components and the ash content. Bleaching and extraction improved the ash-red correlation, but lessened the degree of correlation between the black component and the ash content.

No relation between the color components and the protein content of the flour could be found.

Of the relation of flour color to bread color, it is noted that "a satisfactory method of slicking flour and reading its color should indicate the color of the bread obtained when baked by a simple formula." The black color component was in all cases more abundant in the bread than in the flour, however.

The color comparator described "is not capable of showing the fine differences of the standard slicking method, but it can define differences of substantial importance numerically. Therefore, its use is not in daily control of mill production but rather in confirming and maintaining mill standards, analyzing what is wrong with a flour color, selecting those grades which have a certain characteristic in the flour streams, and for specifying flour color."

Economical muffle furnace operation, C. G. Harrel and S. Duoos (*Cereal Chem., 10 (1933), No. 5, pp. 452–456, figs. 3*).—The authors point out the important power savings to be had by controlling alternating current muffle furnace heating power by means of control transformers, which lose little or no power as waste heat, as compared with the use of rheostats in which the IR^2 loss is large; propose the use, for muffle furnaces heated by direct current, of one of the high-temperature thermostatic devices, of which two are described; note the advisability of automatic control of all electric muffle furnaces; and show, on the basis of an average rate per kilowatt hour, the considerable saving in power, as compared with the cost of the controlling devices, which may be effected by such means.

AGRICULTURAL METEOROLOGY

The work of the Weather Bureau, R. A. Millikan et al. (*Science, 78 (1933), Nos. 2034, pp. 582–585; 2035, pp. 604–607*).—This is a preliminary report of the Special Committee of the Science Advisory Board on the U.S.D.A. Weather Bureau, briefly calling attention to the "multitude of indispensable services" which the Bureau is rendering to all classes of people and kinds of interests and making certain recommendations looking to improvement of the service.

The report says: "The extraordinary skill, resourcefulness, and effectiveness of the Weather Bureau in organizing and maintaining this immense service at practically no cost to the taxpayer is deserving of a much larger admixture of commendation and admiration and a much smaller admixture of criticism than it receives in a recent report by a committee on the Weather Bureau of the American Society of Civil Engineers [E.S.R., 69, p. 494]."

Referring specifically to certain features of the agricultural service of the Bureau, the report calls particular attention to "the economic value of the agricultural forecasts in the saving of crops such as hay, corn, fruits, and vegetables, through the forecasts as to the dangers from rain, drought, and frosts."

Among the more important recommendations made by the committee are the following: "(1) That provision be made at once for extending the so-called air-mass analysis method over the United States, through the cooperation of the Weather Bureau, the Army, and the Navy. . . . (2) That the whole system of recording and reporting meteorological data in aid of forecasting be consolidated under the Weather Bureau (except for the activities necessary to the Army and the Navy). . . . The committee further recommends that, although the air-mass analysis method unquestionably makes short-range forecasts much more reliable, there should be an extension of climatological work which looks toward long-range forecasting." Another recommendation of the committee is that "a permanent Weather Bureau committee, composed of four or five of the outstanding scientists of the country, be set up, the functions of which shall be to keep continually in touch with the work of the Weather Bureau, to be called into conference at least once a year, and oftener if need be, to advise on matters of weather service and policy, and to assist in presenting the claims of the weather service both to the Government and to the public."

Climatological data for the United States by sections, [July–August 1933] (*U.S. Dept. Agr., Weather Bur. Climat. Data, 20 (1933), Nos. 7, pp. [200], pls. 3, figs. 3; 8, pp. [200], pls. 3, figs. 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Meteorological observations, [September–October 1933], C. I. Gunness and H. Jenkins (*Massachusetts Sta. Met. Ser. Buls. 537–538 (1933), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Climatic and pH zones of soils in relation to assimilable potash of the soils [trans. title], J. F. de Ferrière and E. Natier (*Ann. Agron. [Paris], n. ser., 3 (1933), No. 2, pp. 184–209, figs. 10; abs. in Deut. Landw. Rundschau, 10 (1933), No. 12, pp. 768, 769*).—From a study of soils from different parts of France and also from Africa, China, and other regions in connection with the attendant climatic conditions, the general conclusions reached are that as a rule soils of high acidity from regions of high rainfall and humidity are poor in assimilable potash, those from regions of medium rainfall with a pH 6–7 have a medium content of assimilable potash (0.1 to 0.2 percent), and alkaline soils from arid regions, desserts, steppes, etc., are high in assimilable potash. It is pointed out, however, that long drought alternating with floods, as in Cochin China, tends to increase assimilable potash in the soil. How the results of this study may be used as a basis for zoning soils is indicated, and their bearing on the selection and fertilizing of crops is pointed out.

A method of representing atmospheric conditions in agricultural ecology [trans. title], L. Chaptal (*Ann. Agron. [Paris], n. ser., 3 (1933), No. 3, pp. 359–365, figs. 2; abs. in Deut. Landw. Rundschau, 10 (1933), No. 12, p. 768*).—A method of evaluating and representing by means of ecological climagraphs the daily, monthly, seasonal, and annual effect of as many as eight different climatic factors is described, and its application to specific conditions is explained.

SOILS—FERTILIZERS

[Soil research of the U.S. Department of Agriculture, 1933] (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. 77, 78*).—These pages note the mapping of 27,771 sq. miles of agricultural lands in 29 States, studies of soil colloids, fertilizer investigations as to the lack of available magnesium and zinc in certain soils, and an ill effect upon the shipping qualities of strawberries induced by early spring applications of quickly available nitrogen.

[Soil and fertilizer investigations of the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 10–28, 35, 36, 54, figs. 6*).—The report contains brief items on numerous soil investigations by E. E. De Turk, R. H. Bray, J. C. Anderson, F. C. Bauer, F. H. Crane, J. E. Gieseking, H. J. Snider, O. H. Sears, and L. E. Allison, the captions including the following: 1,090 more square miles mapped in soil survey, reasons found why soils vary in potassium fertility, first cycle in soil-bin studies completed this year, basic treatments essential to sound soil management, old plats show benefits of reducing corn acreage, livestock cropping plan may put grain farmer behind, good soil treatment will pay even with lespedeza, crop yields take costly slump when manuring stops, fertilizer studies guide farmers in adjusting crops, crop characteristics are guide in soil treatment, potassium improves corn on Illinois "alkali spots", potassium supply may be clue to low corn yields, soybeans valuable soil improver if properly handled, and effective use of straw lessens heavy drain on soils.

[Soil Survey Reports, 1929 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 15, pp. 34, fig. 1, map 1; 16, pp. 21, fig. 1, map 1; 17, pp. 27, fig. 1, map 1; 18, pp. 28, fig. 1, map 1; 19, pp. 48, pl. 1, fig. 1, map 1; 20, pp. 37, pls. 2, fig. 1, maps 2*).—The six surveys of which the reports are here noted were made with the cooperation of the experiment stations or other agencies of the respective States.

No. 15. *Soil survey of Guthrie County, Iowa*, C. L. Orrben et al.—Guthrie County, southwest of the center of Iowa, possesses an area of 380,800 acres, of which "that part lying northeast of the [Middle Raccoon] River has a characteristic constructional relief due to glacial deposition, and the part lying southwest of the river has a characteristic destructional relief due to the development of an erosion cycle, now in submature development, on a smooth plain."

Soils of 17 series, inclusive of 23 types, are here mapped and described, Tama silt loam leading with 32.4 percent of the area. Shelby loam occupies 25.8 percent, and Carrington loam 10.7 percent.

No. 16. *Soil survey of Macon County, North Carolina*, R. E. Devereux et al.—Macon County covers 332,800 acres in southwestern North Carolina, having adequate to excessive drainage and a surface so rough and mountainous that only a small proportion of it is under cultivation.

Porters loam, of which "only a small part is in cultivation," forms 34.1 percent of the county and is the most extensive of 9 types here listed as 6 series. Porters stony loam, of which "only small spots . . . are cultivated, and only a few small areas are used for pasture or orchards," constitutes 12.7 percent. Unclassified rough stony land and rock outcrop constitute 32 percent of the area.

No. 17. *Soil survey of Brown County, Wisconsin*, A. C. Anderson et al.—Brown County, east-central Wisconsin, possesses an area of 338,560 acres of lands having for the most part the form of a glacial till plain, still predominantly constructional. The Fox River forms an important part of the drainage system.

The soils of Brown County are here mapped and described as 19 series of 32 types. Kewaunee silty clay loam, agriculturally important and by far the most extensive type, occupies 26.5 percent of the area. Rough broken land occupies 1.2 percent.

No. 18. *Soil survey of Coosa County, Alabama*, A. E. Taylor and J. F. Stroud.—Coosa County consists of 413,440 acres of east-central Alabama, of which about 70 percent is "so rough and broken in surface relief and so badly gullied" as to be nonagricultural. The Coosa and Tallapoosa Rivers are the main drainage outlets. The most extensive classifiable soil materials found, among 13 series of 14 types, were 20.2 percent of Cecil gravelly sandy loam and 17.3 percent of Talladega gravelly silt loam. Unclassified rough broken land and rough mountainous land constitute a total of 30.6 percent of the county.

No. 19. *Soil survey of the Capistrano area, California*, E. J. Carpenter and R. E. Storie.—Bounded on the southwest by the Pacific Ocean, the Capistrano area occupies 267,520 acres in San Diego and Orange Counties, southwestern California, and consists, topographically, for the most part of gently sloping alluvial fans running back to hill lands, rolling, steep, or mountainous, on the eastern border of the area. Very numerous short streams provide drainage.

The soils of the area were found to constitute 27 series of 29 types of which Diablo clay adobe, 18 percent of the total area, is the most extensive. The unclassified material found consisted essentially of 24.6 percent of rough mountainous land and 11.6 percent of rough broken land.

No. 20. *Soil survey of the Yuma-Wellton area, Arizona-California*, F. O. Youngs et al.—The Yuma-Wellton area, occupying 403,840 acres in the southwest corner of Arizona with a slight extension into California, includes the Yuma irragation project lands together with adjoining lands where agricultural development appears likely. The region is one of comparatively smooth plain interrupted by narrow mountain ridges. Drainage is generally good.

The four series, Gila, Superstition, Mohave, and Cajon, were recognized, of which Superstition sand was found to occupy 25.3 percent of the area. Unclassified soils comprised 24.2 percent, of which 11.6 percent consisted of undifferentiated alluvial soils, 5.7 percent of rough broken land, and 5.8 percent rough stony land.

[Soil Survey Reports, 1930 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 8, pp. 32, fig. 1, map 1; 9, pp. 28, fig. 1, map 1; 10, pp. 46, fig. 1, map 1; 11 pp. 37, fig. 1, map 1; 12, pp. 29, fig. 1, map 1*).—The five survey reports here noted were prepared with the cooperation of the Iowa and Michigan Experiment Stations or the Nebraska University State Soil Survey.

No 8. *Soil survey of Hitchcock County, Nebraska, F. A. Hayes et al.*—Hitchcock County occupies an area of 453,120 acres in southwestern Nebraska, of which about 85 percent is upland, the remainder alluvial land. In general, good drainage is provided.

Of the 8 series of 18 types listed, Keith silt loam and Colby silt loam are outstanding, amounting, respectively, to 51.4 and 29.8 percent of the total area.

No. 9. *Soil survey of Hancock County, Iowa*, F. R. Lesh et al.—Hancock County, north-central Iowa, has an area of 364,800 acres of nearly level to undulating and rolling plains, adequately drained by natural channels or improvements.

The soils are mapped and classified as 11 series of 14 types. Clarion loam and Webster silty clay loam, highly productive and extensive soils, cover, respectively, 36.4 and 30.9 percent of the area.

The report contains also recommendations for the management of Hancock County soils.

No. 10. *Soil survey of Eaton County, Michigan*, J. W. Moon et al.—Eaton County includes an area of 369,920 acres in the south-central part of the Lower Peninsula of Michigan. The land surface is that of a glacial deposition plain including a few shallow valleys and low hills, also mostly of glacial origin.

The soils are classified under 25 series of 31 types. Miami loam and Conover loam occupy respectively 30.3 and 20.5 percent of the total area.

No. 11. *Soil survey of Colfax County, Nebraska*, A. W. Goke et al.—The area included in this county, located in east-central Nebraska, amounts to 259,200 acres and forms part of an extensive loess-covered plain, ranging in surface from almost level to strongly rolling and with a generally adequate drainage system.

The soils are assigned to 11 series of 15 types. The very productive Marshall silt loam covers 27.8 percent of the area, while Moody silt loam, also a soil of agricultural importance, and Wabash silt loam, one of the best of the bottom-land soils, occupy 24.1 and 15.9 percent, respectively.

No. 12. *Soil survey of Harlan County, Nebraska*, W. J. Moran et al.—Harlan County, near the center of the south border of Nebraska, has an area of 367,360 acres which form part of a broad, slightly eastward sloping, loess-covered plain cut by the valleys of the Republican River, Sappa Creek, Prairie Dog Creek, and the numerous drainage ways tributary to these streams.

The soils were found to consist of 11 series of 12 types. Of these, Holdrege silt loam, one of the most productive upland soils of the region, totals 50.1 percent of the area. Colby silt loam follows with 27.4 percent.

Soil survey of the Paso Robles area, California, E. J. Carpenter and R. E. Storie (*U.S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1928, No. 34, pp. 67, pls. 3, figs. 2, map 1*).—The Paso Robles area, 821,120 acres in west-central California, lies in San Luis Obispo County at from 8 to 20 miles inland from the Pacific Ocean, contains such topographic features as low rolling hills merging into the Diablo Mountains, flat-topped mesas, etc., and is drained mainly by the Salinas River and connected streams.

The area was found to have soils assignable to 25 series including 39 types, of which Linne clay loam was found to occupy 17.1 percent, rough mountainous land 24, and rough broken and stony land 6.4 percent.

The survey was carried out in cooperation with the California Experiment Station.

The soils of Maryland: Productivity classification, O. C. Bruce and J. E. Metzger (*Maryland Sta. Bul. 351* (*1933*), *pp. 28*).—"In this bulletin will be found, classified, all of the soil series and types for each county of the State. . . . The soil groups are arranged according to their relative agricultural value. Each group is given a numerical value on a State basis and in addition an intergroup value, with and without fertilizers, for each of the leading agricultural commodities."

Soils of Henderson, Hidalgo, Milam, Nacogdoches, Navarro, Wichita, Willacy, and Victoria Counties, G. S. Fraps (*Texas Sta. Bul. 482* (*1933*), *pp. 64*).—Detailed chemical analyses, condensed descriptions, and pot experiments on samples of typical soils from eight counties are reported, and the results are discussed. Some of the soils were found low in nitrogen and in phosphoric acid, but better supplied with potash. Few were acid and many were basic or even calcareous.

The zonal sequence of soil profiles in Saskatchewan, Canada, A. H. Joel (*Soil Sci.*, *36* (*1933*), *No. 3, pp. 173–187, pls. 2*).—"The primary aims of this paper are to portray the general arrangement of soil profiles in the central or Saskatchewan portion of the semiarid and subhumid region of western Canada; to discuss their comparative extent and morphology; and to correlate briefly the more important profiles with the fundamental factors of their development."

The profiles are considered as a sequence of zonal groups extending from the short grass plains bordering the Montana-Saskatchewan segment of the international border into the zone of woods and muskeg in the far north. Profiles are described chiefly in terms of morphological characters, chemical data being reserved for later publication.

Soil profile and root penetration as indicators of apple production in the lake shore district of western New York, A. T. Sweet (*U.S. Dept. Agr. Circ. 303 (1933), pp. 30, figs. 17*).—In the lake-shore, or principal commercial apple-growing district of New York State, a close relation was found between soil profile, depth of rooting, and apple production. One may, "by careful observation and the use of pick and shovel, judge the value of his soil for orchard planting with a fair degree of accuracy. Dark-colored, poorly-drained soils are to be avoided. Soil with imperfect underdrainage, indicated by strongly developed gray layers or by heavy mottling of light gray and rust brown, especially soils occupying flat topography and having impervious or shallow subsoils, are to be used with caution. Soils and subsoils of nearly uniform color and with gradual gradations in texture are preferable to soils with sharp, abrupt changes in either color or texture."

A study of some salt water flooded soils on the Eastern Shore of Virginia, J. B. Hester (*Soil Sci., 36 (1933), No. 6, pp. 427–434*).—Of several thousand acres of farm land flooded with salt water during a storm those soils which had been cultivated just before the flooding showed a sodium chloride content much greater than that of the soils which had not been cultivated, and "the sodium chloride content of the surface 0–3⅛-in. soil horizon increased during dry periods and decreased during rainy periods throughout the summer.' About 0.2 percent sodium chloride was found to be serious on the light sandy soils, whereas greater concentrations did not kill strawberry plants outright on the soils high in organic matter. Considerable replaceable calcium was removed, whereas magnesium was increased somewhat by the flooding of the soil.

The effect of additions of certain Colorado soils upon the nitrogen balance of a Tennessee soil, C. A. Mooers, W. H. MacIntire, and J. B. Young (*Soil Sci., 36 (1933), No. 5, pp. 361–368, fig. 1*).—To the authors of this communication from the Tennessee Experiment Station, "it seemed possible that the incorporation of an ample amount of a Colorado soil of high nitrifying and fixation capacities would impart such properties to a Tennessee soil. The outgo of ammoniacal, nitrite, and nitrate nitrogen from the original Colorado soils and their 1 percent admixtures with a Tennessee Cumberland clay loam were therefore studied by means of lysimeters during a 4-year period."

The unusual properties of the Colorado soils were not maintained, nor were they transmitted to the Tennessee soil under any of the experimental conditions imposed.

The effects of additions of certain Colorado soils upon the outgo of bases, chlorides, and sulfates from a Tennessee soil, W. H. MacIntire, W. M. Shaw, B. Robinson, and K. B. Sanders (*Soil Sci., 36 (1933), No. 6, pp. 435–446*).—Two "brown-spot" calcareous Colorado soils, rich in accumulated salts and exchangeable bases, were compared in a 4-year lysimeter experiment under Tennessee conditions with "a Cumberland clay loam in its natural state and also when modified by supplemental treatments of limestone, red clover hay, and sodium chloride"; and with mixtures of 1 percent of each of the Colorado soils with the Tennessee soil.

Of the observations detailed it is noted, in part, that "the outgo of sodium and chlorine from the Colorado soils was reduced almost to the level found for the Tennessee soil, mainly during the first year and even in the first collection of leachings." But, although the accumulations of calcium and magnesium were speedily and materially reduced, the rate of leaching from both soils continued substantially in excess of that found for the Tennessee soil. The additions of both of the Colorado soils caused a 9.6 percent increase in the leaching of calcium, an effect said to be much less than that produced by red clover hay, and a still smaller fraction of that for the limestone additions. Adding the Grand Junction soil materially increased the leaching of magnesium in all of the groups. In the case of the Rocky Ford soil, however, this did not continue after the first year. "Magnesium outgo was uniformly and materially increased by the clover hay, uniformly and materially depressed by limestone, and unaffected by the sodium chloride additions." The increases in the leaching rate both of calcium and of magnesium resulting from the clover hay additions were less than the increments carried by the additions. The additions of the Grand Junction soil caused a uniform increase in the total removal of sodium. The several combinations reached a common level after the second year. Approximately 95 percent of the added sodium chloride is said to have been covered.

"In spite of its high content of soluble potassium, the Grand Junction soil additions materially depressed the outgo of potassium, whereas the Rocky Ford additions did not. This repressive effect upon potassium outgo was further increased by the limestone treatments. No replacement of potassium was induced by the sodium chloride in any of the three alkaline combinations, although outgo was accelerated in two instances.

"The heavy accumulations of sodium were almost completely removed from the Grand Junction soil during the first year. The sodium carried by the sodium chloride additions was recovered almost completely and uniformly from all combinations, without any apparent effect upon the outgo of either calcium or magnesium.

"Sulfate outgo was increased by the additions of each of the Colorado soils and by clover hay, but in neither case was the effect so great as that induced by limestone; hence, the combined effects of addition, inoculation, and alkalinity of the added soils were less than the effect of limestone upon the factors of sulfofication and mobility of sulfates.

"Chlorine outgo was uniformly increased by the Grand Junction additions and unaffected by those of the Rocky Ford soils.

"The abnormal bacterial characteristics of the Colorado soils were not maintained under the imposed conditions. nor were they imparted to the Tennessee soil in either its natural or its modified state."

The laws of soil colloidal behavior, XII, XIII (*Soil Sci., 36 (1933), Nos. 3, pp. 229–244; 4, pp. 317–327*).—These two additions to a serial contribution (E.S.R., 70, p. 15) from the New Jersey Experiment Stations present, in the first, data showing a relation between the amphoteric nature of the soil and the pH value at which a quantity of aluminum sufficient to injure plants becomes soluble; in the second, the results of a study of osmotic and related phenomena.

XII. *The amphoteric nature of soils in relation to aluminum toxicity*, S. Mattson and J. B. Hester. "Three soils, a Sharkey clay, a Sassafras loam, and a Nipe laterite, representing a high, an intermediate, and a low silica: sesquioxide ratio in the colloidal fraction, were selected as media for the growth of wheat seedlings. The pH of exchange neutrality in N Na_2SO_4 solution was 3.7, 4.6, and 6.2, respectively, whereas the lowest pH recorded for good growth in the electrodialyzed soils and in the absence of nutrient salts was 3.6, 4.4, and 4.8, respectively.

"The higher the isoelectric point of a soil the higher is the point of injury. This is obviously because the activity, the ionization, and the solution of the basic groups in the complex are greater the higher the isoelectric point. This, however, is compensated for by the fact that a high isoelectric point means a high ultimate pH. Soils of this type are probably, therefore, in no greater danger of becoming toxic to plants than are other soils. The isoelectric point and the pH of exchange neutrality were raised by the application of aluminum and lowered through the application of silicate, phosphate, and humus, and the injury point was found to be likewise raised and lowered.

"The effect of adding nutrients raised the injury point inasmuch as more of the toxic constituent was brought into solution. Soils having a high manganese content become toxic at a higher pH than when aluminum alone is the cause."

XIII. *Osmotic imbibition*, J. G. Falconer and S. Mattson.—Having studied the relationship between the applied pressure and the water content of bentonite gels saturated with each of several cations, the authors find that the product $V\sqrt[3]{P}$ (V=cc water per gram dry bentonite and P=applied pressure) is a constant of which the magnitude depends on the nature of the exchangeable cation. Half normal sodium chloride instead of water yielded a constant lower than that given by 0.5 N sodium sulfate. "This is according to the osmotic equation of the Donnan equilibrium." An osmotic interpretation is given.

A study of the colloidal fraction of subsoils from the standpoint of electrodializable bases and buffering, P. B. Myers and G. M. Gilligan (*Delaware Sta. Bul. 186 (1933), pp. 23, figs. 6*).—In extension of earlier studies of certain of the fundamental reactions of soils (E.S.R., 64, p. 207), the authors report upon the results of electrodialyses both of the surface and of the subsoils of samples of Chester loam and of Sassafras silt loam taken from areas unaffected by fertilizer treatment, comparing these results with crop yields obtainable from the soils and subsoils examined.

"Chester loam subsoil supported a normal crop yet yielded little nutrient material when subjected to electrodialysis. On the other hand, the subsoil of Sassafras silt loam yielded a normal amount of inorganic plant nutrients yet failed to support normal plant growth. The experimental evidence indicates that, for the soils studied, the failure of the subsoil to support plant growth cannot be attributed to its inability to furnish the necessary inorganic nutrients."

Water content of soil colloids as related to their chemical composition, L. D. Baver and G. M. Horner (*Soil Sci., 36 (1933), No. 5, pp. 329–353, figs. 10*).—The hygroscopicity shown by soil colloids from which organic matter and free oxides had been removed when such colloids were exposed to an atmosphere in contact with 3.3 percent sulfuric acid "was not appreciably affected by the nature of the colloid, but appeared to be some function of the specific surface. The hygroscopicity over 30 percent H_2SO_4 was affected not only by the chemical composition of the colloid but also by the nature of the exchangeable cations on the exchange complex. The amount of adsorbed water increased with the SiO_2–R_2O_3 ratio of the colloid. Clays saturated with various cations increased in their hygroscopicity values according to the series: $H>Ca>Li\geqq Mg>Na\geqq Ba>K$. Removal of the small amount of organic matter present in these colloids had little effect on their water content. The extraction of soluble Al_2O_3, Fe_2O_3, and SiO_2 did not materially change the water content of the colloids, although there was a tendency for the combined water to decrease with free oxide removal."

The temperature-water loss curves, with the exception of those of permutite, were sigmoid, with distinct points of inflection. The temperature rate of water loss curves exhibited maximum and minimum points at certain temperatures. The temperatures at which these points occur apparently depend upon the chemical nature of the colloid. These breaks are interpreted as representing the temperature at which the crystal lattice of some constituent of the colloidal complex is broken up, causing a more rapid loss of water. The temperature-water loss curves are considered to suggest that there are at least two ways in which water is retained by the colloid. The justification for the arbitrary selection of 110° C. as representing the temperature at which all adsorbed water is driven off is questioned. The suggestion that "combined water" should represent that water which is a part of the crystal lattice of the colloidal complex is made. The temperature-water loss curves indicated differences among the colloidal materials extracted from various soils. Considerable differences were shown by the bentonite, clay, and permutite curves. Preliminary observations on the effect of heating bentonite and Putnam clay on their cation exchange capacities suggested that the water loss-temperature curves give some indication of the nature of the base-exchange complex.

"The nature of the exchangeable cations affects the amount of water removed from a Putnam clay at temperatures lower than about 250°, but have only a slight effect at higher temperatures.

"The total water loss, between saturation over 30 percent H_2SO_4 and ignition, by clays containing different exchangeable cations followed the order: $H > Mg = Ca > Li > Ba \geqq Na > K$. Hygroscopicity of the different colloids increased with the SiO_2–R_2O_3 ratio. The combined water decreased with an increasing ratio. . . . The theory that the same base-exchange material is responsible for cation exchange in bentonite and clay is seriously questioned in the light of these investigations."

Reaction of plants to the density of soil, P. S. Gupta (*Jour. Ecol., 21 (1933), No. 2, pp. 452–474, figs. 5*).—The physical properties of soil under artificial compression have been studied. Quantitative determinations were made of the effect of artificial compression on water capacity, resistance to flow of water, absorption of water, pore space, and penetrability. Culture experiments with beans and oats have been carried out with a view to finding out the direct effect of the density of the soil on growth of these species.

The results, in general, show that with regard to height of tops and area of assimilatory organs the plants in both cases are more or less equally conditioned, i.e., density of soil has little effect on them, but as regards the underground organs they are markedly modified, resulting in smaller and stronger root systems in denser soils. Experiments with water-logged cultures in beans failed, but with oats similar results were obtained as with compressed soils without water-logging; thus the differences observed between growth in compressed and uncompressed soils can be attributed to the soil texture and not to the result of diminished aeration. The presence of root hairs and the absence of any aerating tissue in the root are further evidence that no important part is played by differential aeration in this connection consequent on compressing the soil.

Data respecting the penetrability of the soil at successive levels in the natural plant communities have been obtained and the relation to water content determined. The penetrability, in general, tends to decrease with increase in density which usually accompanies increase in depth from the surface. The penetrability also varies directly with the moisture content. The data submitted indicate that the mechanical properties of the soil as determined by its texture are of considerable importance as affecting plant growth.

Lectures on soil microbiology, A. Rippel (*Vorlesungen über Boden-Mikrobiologie. Berlin: Julius Springer, 1933, pp. VIII+161, fig. 1*).—The book takes up the significance and methods of soil microbiology; distribution of microorganisms in the soil; the carbon, sulfur, nitrogen, and iron cycles; formation and decomposition of humus materials; microbiological influences in the soil; determination of soil fertility by microbiological methods; microbiology of water; and the preservation of organic substances.

Concerning the length of incubation period in physiological studies of bacteria, P. L. GAINEY and F. BRISCOE (*Soil Sci., 36 (1933), No. 3, pp. 165–171*).—Observing that differences in the nitrogen fixing ability of soils corresponding to determinable differences in the number of *Azotobacter* could not be shown by customary methods, the authors of this contribution from the Kansas Experiment Station were led to an investigation of the apparent discrepancy.

Data were obtained which "indicate rather conclusively that the rate of nitrogen fixation on washed agar plates is proportional to, or is a function of, the number of colonies, whereas the quantity fixed (with ample incubation period) is independent of either the number of organisms or the number of colonies. The quantity of nitrogen fixed is probably primarily dependent upon the supply of available energy. Barring possible variations in the efficiency of different species or strains of *Azotobacter* and other minor influencing factors, the quantity of nitrogen fixed in any culture is, therefore, independent of the number of organisms introduced into the culture provided ample time is allowed for the complete utilization of the food by the smaller number of organisms." On this assumption "one should not expect to be able to detect differences in the nitrogen fixing ability of different soils if the incubation period employed is relatively long, as has been the case in many investigations. On the other hand, if the incubation period is relatively short those cultures containing the larger number of *Azotobacter* may be expected to show a more rapid utilization of food and hence a more rapid fixation of nitrogen."

This reasoning was borne out in actual practice by experiments in which no differences in nitrogen fixing ability were apparent after the customary incubations of from 1 to 3 weeks. When the incubation is restricted to a period of from 3 to 5 days only, "differences in nitrogen fixing abilities, corresponding to differences in the number of *Azotobacter*, may be detected by the use of the plate method."

Note on the fixation of nitrogen in local sandy soil by symbiosis between Azotobacter, Oscillaria, and Gleocapsa, F. MENCHIKOVSKY (*Hadar, 6 (1933), No. 10, pp. 238, 239, figs. 2*).—The fixation of N by symbiosis between *Azotobacter*, *Oscillaria*, and *Gleocapsa* is said to have been observed in irrigated poor sandy soils. The algae formed a gray crust, green in its section and covering the soil surface, in which *Azotobacter* was found. The soil studied is described as containing traces of Ca and having a pH of 6.75.

Symbiotic nitrogen fixation in the genus Casuarina, H. MOWRY (*Soil Sci., 36 (1933), No. 6, pp. 409–425, pls. 2*).—In cooperation with the Bureau of Plant Industry, U.S.D.A., the author made a study, at the Florida Experiment Station, of the nature and nitrogen-fixing ability of the root nodule-forming smybiont of nine species of the nonleguminous genus *Casuarina*.

A single strain of the causal organism, apparently a bacterium, produced nodules in from 70 days to 5½ months on roots of the species *C. cunninghamiana* *C. equisetifolia*, *C. fraseriana*, *C. glauca*, *C. lepidophloia*, *C. montana*, *C. sumatriana*, *C. tenuissima*, and *C. triangularis* The comparative growth reactions of four species, *C. cunninghamiana*, *C. equisetifolia*, *C. glauca*, and *C. lepidophloia*, with and without nodules, grown under controlled conditions as to nitrogen supply in a sand medium, showed that fixation of atmospheric nitrogen occurs in the nodules with advantage to the host plant.

The relation of the nitrifying capacity of soils to the availability of ammonia and nitrates, G. S. FRAPS and A. J. STERGES (*Soil Sci., 36 (1933), No. 6, pp. 465–470*).—Nitrate nitrogen was, on an average, 5.4 percent more available than ammonia nitrogen in four soils having a high nitrifying capacity, according to the Texas Experiment Station, and 7 percent more available than ammonia nitrogen in 16 soils having a low nitrifying capacity. There was no indication of a regular relation between the availability of nitric nitrogen and of ammonia nitrogen and the nitrifying capacity of the soil, however, the difference between the two groups being within the experimental error.

"The availability of nitrogen of cottonseed meal was lower than that of either nitrate of soda or sulfate of ammonia." No relation between the availability of cottonseed meal nitrogen and soil nitrification capacity was observed, however.

"The nitrifying capacities of five soils were practically the same after cropping as before cropping in the pot experiments. The nitrifying capacity of three of the soils appeared to be increased by the cropping and addition of fertilizer."

The control of excessive soil nitrates in the Arkansas Valley (*Colorado Sta. Rpt. 1933, p. 7*).—The causes of this condition are noted.

The influence on soil biochemical processes of the saturation of the absorbing complex with iron [trans. title], V. N. SIMAKOV (SIMAKOW) and A. I. ISAKOVA (ISSAKOWA) (*Pochvovedenie (Pédologie), n. ser., 28 (1933), No. 2, pp. 170–184; Eng. abs., p. 184*).—Chernozem and podsol soils of which the exchange complex had been saturated with iron ceased to accumulate nitrates, but continued to produce ammonium compounds. On the other hand, the nitrogen-fixing capacity, as observed in the chernozem soil, was of increased activity after the saturation of the exchange complex with iron.

The iron-saturated soils had a very low pH value—lower in the case of the chernozem soils than in that of the podsol. This is attributed to an exchange capacity greater in the chernozem than in the podsol, exchangeable hydrogen being assumed to be present in the exchange complex in both cases.

The solid phase of the iron-saturated soils was less soluble in water than was that of the corresponding normal soils.

The obligate anaerobic microflora of farmyard manure, H. GLATHE and A. CUNNINGHAM (*Jour. Agr. Sci. [England], 23 (1933), No. 4, pp. 541–554*).—In a preliminary investigation of the obligate anaerobic microflora of samples of ordinary farmyard manure and of Edelmist, strains of *Bacillus sporogenes, B. bifermentans, B. tertius, B. tetanomorphus,* and *B. saccharobutyricus* were isolated and characterized. Anaerobic decomposition of cellulose was observed in media inoculated from both of the samples of Edelmist examined.

For the cultivation and enumeration of the anaerobic bacilli in samples of farmyard manure, the superiority of liquid over solid media was demonstrated. Of the liquid enrichment media tested, egg meat and liver-liver broth proved to be the best.

Microbiological investigation of organic manures.—I, Decomposition of rape-cake, A. ITANO and S. ARAKAWA (*Ber. Ōhara Inst. Landw. Forsch., 5 (1932), No. 3, pp. 427–446, figs. 2*).—The study of the decomposition of rapeseed press cake here described consisted of two groups of experiments separately reported upon: (1) On the decomposition of the press cake in soils under conditions simulating those of field applications, and (2) on the decomposition of the press cake as affected by various bacterial, fungal, and actinomycetal cultures.

In soil under conditions simulating those of the paddy field, inorganic nitrogen production began at once, reached a maximum in 25 days, and then decreased. Bacterial numbers rose with the increase in inorganic nitrogen, but continued to increase after the nitrogen production fell off.

Under soil conditions similar to those of unirrigated farms, ammonification was slow for about 10 days, became rapid thereafter, reached a maximum at 25 days, and continued to the fiftieth day. Bacteria increased with the degree of ammonification, but the number decreased slightly after the twenty-fifth day.

Plate determinations indicated the growth of bacteria only during the decomposition taking place under paddy-field conditions, whereas under dry-farm conditions the growth consisted mainly of Actinomycetes. "In both cases the growth of Actinomycetes was stimulated by the application of rape cake", though in liquid cultures the growth of bacteria only was observable. The ammonification of rapeseed cake is considered primarily due to actinomycetal, rather than to bacterial, activity.

Of 8 strains of Actinomycetes isolated 5 were chromogenic types, 3 nonchromogenic.

In the second group of experiments 12 types of bacteria (9 species), 12 types of fungi, and 8 of Actinomycetes are reported upon. The effects of these cultures were tested both in sand and solution cultures.

The Actinomycetes produced in general the most rapid decomposition. Among the bacteria, the spore-forming types were more active than were the nonspore-forming. The fungi showed considerable variation in ability to decompose rapeseed press cake. Sand cultures were in general more effective than liquid cultures. A reaction initially slightly acid appeared to favor the decomposition. On the other hand, the addition of 2 percent of glucose made the reaction very acid and reduced the soluble nitrogen production to but little more than one half that occurring in the absence of the glucose.

The relation of phosphorus to biological nitrogen fixation and the conformity to the law of decreasing increment, R. A. Greene (*Soil Sci., 36 (1933), No. 5, pp. 383–386*).—The relation between added phosphate and nitrogen fixed by the strains of *Azotobacter* used and by *Clostridium pastorianum*, as observed by the author of this contribution from the Arizona Experiment Station, "seems to follow the law of decreasing increment. When the constant *C* ('Wirkungsfaktor') is calculated from the formula of Mitscherlich, a fair agreement is found in the results. An explanation on this basis agrees with field observations in that the Winogradsky test [E. S. R., 66, p. 616] is usually most accurate in soils extremely deficient in phosphate."

Soluble aluminum studies.—IV, The effects of phosphorus in reducing the detrimental effects of soil acidity on plant growth, W. H. Pierre and A. D. Stuart (*Soil Sci., 36 (1933), No. 3, pp. 211–227, pl. 1*).—In continuation of previous studies (E.S.R., 70, p. 451) on this subject, the authors have now concluded, from both soil and solution culture experiments, that monosodium and monocalcium phosphates reduce the aluminum concentration in the soil solution as a result both of the increased pH and of the precipitation of aluminum phosphate. Superphosphate even in large quantities (2,000 lb. P_2O_5 per acre) did not affect the pH of the soil, but reduced the concentration of aluminum in the soil solution from about 18 to 10 p.p.m.

"Good growth of barley and of alfalfa was obtained in the presence of 8 to 10 p.p.m. of aluminum where large amounts of superphosphate had been added. This is taken to indicate that the beneficial action of large phosphate additions to acid soils is partly due to a reaction of aluminum and phosphate within the plant and not entirely to the precipitation of aluminum in the soil solution."

Yields of lettuce in solution culture were reduced 23 percent by 2.5 p.p.m. of aluminum in the presence of 50 p.p.m. of PO_4, 71 percent in the presence of but 1.0 p.p.m. The plants from the culture containing the large proportion of phosphate had as high an aluminum content as did those grown in a solution of low phosphate content; but the plant sap content was only from one fifth to one seventh as great in the plants grown in the presence of the aluminum as in those grown in aluminum-free solutions.

"The results of these studies are believed to establish the fact that large phosphate additions to acid soils reduce the injurious action of aluminum, not only by tending to precipitate it from the soil solution but also by precipitating aluminum within the plant and by supplying sufficient phosphate for plant growth. In the presence of small amounts of available phosphate, injury to the roots is greater, first, because of the presence of more aluminum in the soil solution and, secondly, because the plants suffer more from a lack of phosphate as a result of the lessened absorption and of the precipitation of a greater proportion of the phosphate within the plant by aluminum."

Commercial fertilizers report for 1933, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 355 (1933), pp. 67+IX*).—Analyses from the 1933 inspection and accessory data are again noted (E.S.R., 68, p. 599).

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1933, C. S. Cathcart (*New Jersey Stas. Bul. 557 (1933), pp. 31*).—This is the first report for 1933 (E.S.R., 68, p. 599), and contains the usual accessory data.

AGRICULTURAL BOTANY

A textbook of botany for medical, pharmaceutical, and other students, J. Small (*London: J. & A. Churchill, 1933, 3. ed., rev., pp. X+717, figs. 1,352*).—This textbook, first issued in 1921, has been thoroughly revised.

The text includes the following chapters: Part 1—Introduction; the story of the dandelion; seeds; germination and seedlings; the cell; the stem; the leaf; the root; the transpiration current, including absorption, ascent of sap, and transpiration; carbon assimilation; respiration; the nitrogen cycle, including insectivorous plants; buds; branching and phyllotaxis; growth; secondary growth; climbing plants; storage and utilization of reserves; the flower; the inflorescence; pollination; fertilization and embryology; the fruit; seed dispersal; the permeability of protoplasm; plant movements; heredity; evolution; ecology; and plant enzymes. Part 2—Principles of classification; the phyla; algae; fungi; lichens; bacteria; Bryophyta; Pteridophyta; Gymnospermae; Angiospermae; reproduction; and the uses of botany. The five appendixes deal with the following: Diagnostic characters of certain medicinal or poisonous plants; scheme for the technical description of a plant; tests for tissues and various plant substances; special types of lower plants, including brief summaries of the structure and biocycles of these types; and the molecular structure of cell walls.

On intermittent germination as illustrated by Helianthemum guttatum Miller, D. V. Juby and J. H. Pheasant (*Jour. Ecol., 21 (1933), No. 2, pp. 442–451, pl. 1, fig. 1*).—An account of the type of germination of seeds of *H. guttatum* is given, wherein intermittent germination was found to be constantly exhibited. Very high percentage germination in this species (90 to 100 percent) was not attained till from 200 to 300 days after sowing, but the highest germination occurs about the tenth day.

The cause of the intermittent germination was investigated, and it was found that when the testas were abrased simultaneous germination was produced. Hourly determinations on seeds from which the testas were completely removed showed that the simultaneous character of the germination observed was real and not merely apparent. It was found that in any batch of seeds investigated some were soft and some hard. Prolonged soaking in water was found to soften hard seeds. Soft seeds germinated within a few days after sowing, while the hard seeds germinated only after their testas had become permeable.

Available food, relative growth, and duration of life in seedlings of Cucumis melo, S. A. Gould, R. Pearl, T. I. Edwards, and J. R. Miner (*Natl. Acad. Sci. Proc., 19 (1933), No. 2, pp. 228–233, fig. 1*).—In each of 10 groups of cantaloup seeds a different proportion of the cotyledons was cut away. Treated seeds and controls were planted on agar and grown in darkness at 30° C. until death occurred, when fresh and dry weights of the cotyledons, hypocotyl, and roots were taken. Each group exhibited the characteristic sigmoid growth curve, and the final heights were greatly influenced by the initial seed weight. In all measured characters both for growth and duration of life, excepting the final dry weight of the cotyledons, the relative performance of the plant was consistently greater than would be expected on the basis of strict proportionality to the amount of food left in the seeds as planted.

A note on the occurrence of small outgrowths on the calyx ring of the cotton flower, C. Jaganatha Rao (*Madras Agr. Jour., 21 (1933), No. 9, p. 394, pl. 1*).—It is concluded that outgrowths on the calyx ring of a pure line of cotton, No. 54, a Northerns Selection of *Gossypium indicum*, serve to distinguish the culture and are partially dominant in F_1.

Studies on the growth hormone of plants.—III, The inhibiting action of the growth substance on bud development, K. V. Thimann and F. Skoog (*Natl. Acad. Sci. Proc., 19 (1933), No. 7, pp. 714–716*).—In experiments to determine whether a substance of the same general nature as the growth-promoting substance of *Avena* coleoptiles is responsible for the inhibition, by a terminal (or distal lateral) bud, of the growth of lateral buds below it, agar blocks of medium on which *Rhizopus suinus* had grown (i.e., containing "growth substance"), having an activity of about 2.10^{-6} mg per plant unit, and agar blocks into which growth substance which had diffused into the agar from decapitated terminal buds of *Vicia faba* were applied to tops of decapitated plants, intact plants, and decapitated plants to which plain agar blocks were applied being used as controls. "When the amount of growth substance applied was of the same order as that diffusing from the terminal bud into agar (160 plant units every 6 hours), a slight but definite inhibition of the development of the lateral buds was observed. When, however, the amount of growth substance applied was larger than that diffusing from the terminal bud (1,400–1,700 plant units every 6 hours), the development of lateral buds was completely inhibited."—(*Courtesy Biol. Abs.*)

The physiological value of leaves of different ages at different stages of development of a given plant [trans. title], Z. M. Eidel'man (Eidelman) and E. A. Bankul (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U.S.S.R., Inst. Plant Protect., Bul. Plant Protect.), Control Measures and Impl., No. 3 (1933), pp. 131–146, figs. 5; Eng. abs., pp. 145, 146*).—The data obtained on the intensity of photosynthesis in leaves, the accumulation of soluble carbohydrates during the day, and transpiration in wheat, as well as data on the intensity of gas exchange during photosynthesis in soybeans, indicate that owing to the complexity of the problem it is difficult to determine the difference in the work of the physiological mechanism in leaves of different "tiers." Determinations of soluble carbohydrates by the Hagedorn-Jensen method showed that during the sprouting stage, 9 a.m. to 2 p.m., the most intensive assimilation takes place in leaves of the fourth and fifth tiers, whereas in the leaf of the sixth tier it is less than in that of the third. During the flowering stage a greater accumulation of assimilated substances was noted in the leaf of the sixth tier than in that of the fifth. During the sprouting and flowering stages the rate of evaporation was greater in old than in young leaves, whereas during the "milk ripe" stage it was equal in all leaves. At all stages of development the rate of evaporation in old leaf sheaths was greater than in young ones.

The authors suggest that the discrepancies in the results of various investigators may be due to the fact that at different stages of development of the plant the rate of evaporation in young leaves differs from that noted in the old ones.—(*Courtesy Biol. Abs.*)

Effect of the mechanical reduction of the leaf surface and different nutritive conditions on the accumulation of dry matter in cereals [trans. title], Z. M. Eidel'man (Eidelman) and E. A. Bankul (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U.S.S.R., Inst. Plant Protect., Bul. Plant Protect.), Control Measures and Impl., No. 3 (1933), pp. 113–130, figs. 2; Eng. abs., pp. 129, 130*).—Barley was grown on sand in Mitscherlich containers in the open air. Prianishnikov's nutritive mixture, full strength and either completely lacking or containing one third or one tenth of the normal dose of nitrogen, phosphorus, or potassium, was tested. The removal of 25, 50, and 100 percent of the leaf surface in the "tubing" stage of plants grown under different nutritive conditions had no effect on the time of the commencement of the "sagittal," "flowering," and "earing" stages.

From data on the weight of vegetative parts of plants at the time of harvest (with different percentages of the leaf surface removed at the tubing stage and controls), grown under different nutritive conditions, the authors infer that fertilizing has the same effect on healthy and diseased plants. The effect of reduction of the leaf surface of plants grown under different nutritive conditions was less marked in barley than in spring wheat. Reduction of the leaf surface had a less marked effect on the root system than on the aboveground parts.

The intensity of photosynthesis increased with the increase of the doses of phosphorus and all other elements, with the exception of nitrogen. Reducing nitrogen to one tenth the normal dose gave results equal to those of plants grown on a mixture containing full doses of all the nutritive elements. The removal of 50 percent of the leaf surface caused an increase in the intensity of photosynthesis, which decreased after from 9 to 10 days when phosphorus was used, and after 14 days when nitrogen and other elements were used.—(*Courtesy Biol. Abs.*)

Some morphological and physico-chemical changes accompanying proliferation of Bryophyllum leaves, R. O. Freeland (*Amer. Jour. Bot., 20 (1933), No. 7, pp. 467–480, pls. 2*).—Studies carried on at the Ohio State University indicated that during proliferation of *B. crenatum* and *B. calycinum* leaves, shoots grow from rather definite primordial tissues which begin to develop in the notches of very young leaves. Stem and leaf primordia develop first and are exogenous. Root development is endogenous, but the point of origin is different in the two species. H-ion concentration and total acidity increase in the leaf margins at first and then decrease. Osmotic values are usually higher in the margins of proliferating leaves than in paired inactive leaves. Water content, leaf position, and length of day are not directly related to the dormancy of foliar buds. During proliferation of *B. calycinum* leaves the following chemical changes occur: An increase of starch, reducing sugars, oxidase, diastase, and catalase around the foliar buds; an increase of total sugars, sucrose, and amino amide, and nitrate nitrogen in the entire leaves; and a decrease in fresh and dry weight and total polysaccharides in the entire leaves.—(*Courtesy Biol. Abs.*)

The influence of acids on assimilation in woody plants [trans. title], A. Wieler (*Jahrb. Wiss. Bot.*, *78* (*1933*) *No. 4*, *pp. 483–543*, *figs. 3*).—An extensive experimental study was made of the effect of SO_2 on from 3- to 10-year-old pine, spruce, larch, birch, oak, beech, and linden trees. The assimilation of the plants was reduced at dilutions lower than those necessary to cause discoloration of the leaves. Tests using HCl gas gave similar results, indicating that the action is due to the acid nature of the gases. Studies were made in the open by directing a stream of SO_2 on the plants. The loss in capacity to assimilate CO_2 was carefully determined in the laboratory. At concentrations of about 1:500,000 the assimilation capacity is strongly reduced, and upon repeated exposure it falls still lower. The plant may show delayed response due to the freeing of SO_2 which accumulates in the tissues. The author suggests that the reduction of assimilation may be due to the action of the acid in freeing the iron from the chloroplasts, thus stopping assimilation until the effect wears off. Tests for iron in plants exposed to SO_2 showed more abundant water-soluble iron compounds, making a useful test to detect SO_2 injury around factories. The sulfurous acid may combine with the glucose or aldehyde group of the protein. The term "acute injury" should be limited to injury in which the cells have been directly killed by the acid, while "chronic injury" should be limited to injury in which the assimilation processes have been interfered with.

Contrary to Wislicenus, the younger leaves are more susceptible to injury than the older ones.—(*Courtesy Biol. Abs.*)

Effect of manganese deficiency on the growth and sugar content of plants, L. P. Miller (*Amer. Jour. Bot.*, *20* (*1933*), *No. 10*, *pp. 621–631*, *figs. 2*).—Analyses of manganese-deficient wheat, corn, lettuce, and tomato plants, and tomato fruits grown in soil culture showed that these plants were much lower in reducing sugars and sucrose than corresponding plants which had received a small amount of manganese. The manganese necessary for tomato plants could be added directly into the stems of the plants, and in this way manganese-deficient plants could be grown in the same pots with plants receiving manganese.

The results indicate that manganese plays an important role in sugar formation and sugar metabolism, either directly or indirectly.—(*Courtesy Biol. Abs.*)

On the presence of anthocyanin pigments or oxyflavin compounds in the aleurone grains of certain Gramineae [trans. title], J. Chaze (*Compt. Rend. Acad. Sci.* [*Paris*], *196* (*1933*), *No. 13*, *pp. 952–955*).—This investigation demonstrated that the red pigment found in seeds of red varieties of corn is located in the pericarp and is composed of oxyflavonic compounds, while the dark pigments of black varieties are anthocyanin compounds adsorbed by the aleurone grains. In the black varieties the pericarp is colorless. In yellow or white corn and in several varieties of species of the genera *Hordeum*, *Triticum*, *Avena*, and *Secale* the aleurone grains also contain oxyflavonic compounds. Upon germination the oxyflavonic compounds change to anthocyanin. Due to the close attachment of both pigments to the aleurone grains, they form an adsorption complex that modifies the solubility of the pigments, rendering them insoluble in alcohol.—(*Courtesy Biol. Abs.*)

Osmotic value in trees [trans. title], M. Pfeiffer (*Ztschr. Wiss. Biol.*, *Abt. E*, *Planta*, *Arch. Wiss. Bot.*, *19* (*1933*), *No. 1*, *pp. 272–278*).—The cryoscopically determined osmotic value of the phloem sap exuding from notches cut in the bark of *Quercus rubra* increased from 15 atmospheres on August 12 to 21.1 atm. on November 5. The maximum in *Robinia pseudacacia* was 30 atm. The osmotic value of the phloem sap decreased from top to bottom of the stem at the rate of 0.29 atm. per meter. A decrease in osmotic value from the leaves to the phloem sap of the stem was also found, amounting in *Cucurbita pepo* to 7.7 atm. The horizontal distribution of osmotic values in *Castanea vesca* was for wood 7.5 atm., cambial sap 11.3, phloem 15.8, and bast layer from 12.8 to 8.0 atm. Growing plant parts showed lower osmotic values than storage and assimilating organs, immature acorns having an osmotic value of 8.3 atm. and germinating acorns an osmotic value of 7.1 atm.

Studies with artificial cold showed a close correlation during the entire year between the intensity of coldness and the osmotic value in shoots of *Picea excelsa*.—(*Courtesy Biol. Abs.*)

A comparison of osmotic concentrations of supplying and receiving tissues and its bearing on the Münch hypothesis of the translocation mechanism, O. F. Curtis and H. T. Scofield (*Amer. Jour. Bot., 20* (*1933*), *No. 7, pp. 502–512*).—Osmotic concentrations of supplying and receiving tissues were determined at Cornell University by measurements of the direct freezing point of living tissue, the freezing point of extracted sap, and, in one case, by plasmolytic measurements with sucrose solutions. Such measurements were made with potato tubers (*Solanum tuberosum*) and the sprouts developing from them; cotyledons of beans (*Phaseolus vulgaris*) and squash (*Cucurbita maxima*) and growing points of the dependent seedlings; parent leaves of Bryophyllum *pinnatum* and *Byrnesia* (*Echeveria*) *weinbergii* and the plantlets developing from them; and storage scales of onion (*Allium cepa*) and the young leaves, as well as root tips, drawing their supplies from them.

For each type of material tested the osmotic gradient was found to lead from the receiving tissue to the supplying tissue. This is the reverse of the requirements of the Münch hypothesis of solute transfer, which demands a turgor and osmotic gradient leading from supplying to receiving tissues.—(*Courtesy Biol. Abs.*)

Some physico-chemical properties of seed extracts, C. A. Shull and J. W. Mitchell (*Bot. Gaz., 95* (*1933*), *No. 2, pp. 258–278, fig. 1*).—Seeds of black amber sorghum, Japanese buckwheat, mammoth clover, and Arlington cowpea were ground to a fine state of subdivision (60–100 mesh) and extracted with water at 32° to 34° F. Freezing point depression measurements were made also on mixtures of the seed powders and water at different degrees of dilution. The extracts were analyzed for total carbohydrates, ash, nitrogen, and solids. The concentration of the sugar and ash constituents were found to be large enough to account satisfactorily for the degree of depression of freezing point observed in the mixtures of seed powders and water. The nitrogen of the extracts was too small in amount to influence the freezing points noticeably. The values found were in general confirmation of the findings of Bouyoucos and McCool (E.S.R., 44, p. 728), but somewhat lower.

The results are held to disprove the theory that the depression of freezing points in such mixtures is mainly due to proteins.—(*Courtesy Biol. Abs.*)

Transpiration of tobacco plants in relation to radiant energy in the visible and infra-red, J. M. Arthur and W. D. Stewart (*Contrib. Boyce Thompson Inst., 5* (*1933*), *No. 4, pp. 483–501, figs. 3*).—The transpiration rates of tobacco plants were studied under both visible and infrared radiation, with temperature and humidity controlled by standard air-conditioning machinery.

At a temperature range of 73°–78° F., an increase of 2.3 times the energy doubled the rate of water loss, this relation appearing to be independent of humidity within a range of 50–80 percent relative, under the test conditions. At high temperatures (98°–100°), an increase of humidity from 68–87 percent relative produced a slight decrease in water loss under both visible and infrared-alone conditions, and caused great injury to most plants. At a lower temperature (73°–78°), the rate of loss under a lamp without a filter (visible and infrared) was about 2.5 times the loss under the lamp with a heat-transmitting filter (infrared alone). When the temperature rose to 98°–100°, the infrared rate of loss increased rapidly until the visible rate was only 1.3 times that of the infrared. Water losses at this high temperature under visible conditions were 2.75 g per square inch of leaf area in 12 hours as compared with 2.09 g under infrared only.

The stomata were found completely closed under infrared, suggesting that the high rate of transpiration is wholly cuticular. Transpiration was effectively stopped by inclosing the leaf in a cellophane envelope, the temperatures of inclosed leaves at high radiation values rising from 87° to 127° in an exposure of four minutes. A leaf thoroughly vaselined on both surfaces maintained a relatively high transpiration rate and showed very little rise in temperature as a result of treatment. Water losses in tobacco plants were found sufficient to hold the leaf at a temperature not to exceed 107° under all conditions imposed in these tests.

Evaporation, transpiration, and oxygen consumption by roots, W. A. Cannon, D. Demaree, and E. A. Purer (*Science, 78 (1933), No. 2026, pp. 388, 389*).—Controlled experiments with shoots in culture solutions showed that the rate of oxygen consumption by the root of willow is indirectly affected by the light relations of the shoot and may be directly affected by the temperature of the solution. There appears to be no positive relation between transpiration rate and rate of oxygen absorption by the root. There may be a direct relation between evaporating power of air, as revealed by the B/W atmometer readings, and rate of oxygen consumption. Whether a high evaporation rate, in the willow at least, influences oxygen absorption by the root remains to be shown.

The intake of water through dead root systems and its relation to the problem of absorption by transpiring plants, P. J. Kramer (*Amer. Jour. Bot., 20 (1933), No. 7, pp. 481–492*).—The roots of several species of woody and herbaceous plants were killed by immersing the pots in hot water. When the soil surrounding the dead roots was kept well watered, the tops of such plants remained alive and unwilted for several days. In all cases considerable quantities of water were absorbed through the dead root systems, though less than by plants with living roots.

In most experiments the transpiration rate decreased rapidly after the roots were killed. This apparently was due principally to leaf injury and to the plugging of the xylem by deposits of gum, both probably resulting from the effects of substances escaping from the dead cells of the roots. When suction was applied to the stems of plants from which the tops had been removed, it was found that water passed in more rapidly from the soil through dead than through living root systems. The reduction of the moisture content of the soil brought about by living and by dead root systems attached to a vacuum pump was about the same.

Since in these experiments water was so readily absorbed through dead roots, it is surmised that the importance of the role played by the living cells of roots in absorption has been overemphasized. It appears that the intake of water by transpiring plants is due largely to the tension or negative pressure developed in the hydrostatic system by the removal of water in transpiration and other processes.—(*Courtesy Biol. Abs.*)

An apparatus and method for determining bound water in plant tissue, A. L. Stark (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 384–388, figs. 2*).—The construction and operation of an apparatus developed at the Iowa Experiment

Station and used with the heat-of-fusion or calorimetric method for measuring bound water are discussed.

Super optimal and thermal death temperatures of the cotton plant as affected by variations in relative humidity, D. M. and E. E. BERKLEY (*Ann. Missouri Bot. Gard., 20 (1933), No. 4, pp. 583–604, figs. 3*).—Upland cotton plants from 5 to 180 days old were exposed to superoptimal and thermal death temperatures for periods ranging from 0.5 min. to 72 hrs. In one series the plants were exposed to temperatures below 42°–84° C. at an average relative humidity of 69 percent at temperatures below 50°, while in the second series plants were exposed to 40°–65° at an approximately saturated atmosphere.

Seedlings resisted high temperatures less than older plants at any given relative humidity, and the plants were less resistant to high temperatures at a higher relative humidity. Leaves and cotyledons were affected first at the higher relative humidity, while the seedlings' hypocotyls and petioles and young stems of older plants were affected first at the lower relative humidity. The cotyledons lost water rapidly with treatment at the lower humidity, while the hypocotyls lost very little. After removal from the treating chamber, the cotyledons regained much of the water lost and became turgid again, whereas the hypocotyls continued to lose moisture until completely withered. The saturated atmosphere of the second series seemed to have the additional effect of smothering the plants. The authors tentatively define the thermal death point.

The effect of humidity upon the rate of evaporation, P. F. HAMMOND and R. GOSLIN (*Ecology, 14 (1933), No. 4, pp. 411–413, fig. 1*).—In experiments under constant temperature conditions in the laboratory with chemically controlled humidity, the evaporation in milligrams per hour was proportional to 100 percent minus the relative humidity of the air above the surface from which evaporation is taking place.—(*Courtesy Biol. Abs.*)

The influence of length of day on the response of plants to boron, K. WARINGTON (*Ann. Bot.* [*London*], *47 (1933), No. 187, pp. 429–457, pls. 2, fig. 1*).—It is concluded that the delay in appearance of boron deficiency symptoms and flowers observed in the spring and autumn compared with summer-grown plants is due to the reduction in the length of day rather than to the lowered temperature, but no special association between the function of boron and flower production was found except insofar as all meristematic processes are affected by a lack of this element. Within a range of from 7 to 16 hours the length of day has no bearing on the need of the plant for boron, and the characteristic deficiency symptoms are similar, although less pronounced, under long or short day conditions. Shortening the day does not result in degeneration effects, as are induced by a lack of boron, although the influence of the two factors may bear a superficial resemblance to each other, as where flowering is prevented. The presence of each factor modifies the effect of the other, but the lack of boron exerts the more fundamental influence on the plant.—(*Courtesy Biol. Abs.*)

Tomatoes, berries, and other crops under continuous light in Alaska, G. M. DARROW (*Science, 78 (1933), No. 2025, p. 370*).—Attention is called to the production of strawberries under 6 weeks' continuous daylight in central Alaska. Experimentally, several species and varieties were grown for 5 months under continuous artificial light only. Their not very vigorous condition was attributed to suboptimum light intensity or other factors.

Despite reports that daily artificial or artificial and daylight exposures of 17 or more hours injured tomatoes, remarkably vigorous plants have been grown out of doors at Fairbanks, Alaska, under continuous daylight for 6 weeks.—(*Courtesy Biol. Abs.*)

Artificial light and plant growth, J. M. Arthur (*Agr. Engin., 13 (1932), No. 11, pp. 288–291, figs. 5*).—This is a discussion of the effects of quality, intensity, and day length as related to the commercial production of plants by means of artificial light.

A further experiment on the growth of buckwheat seedlings under tungsten lamps operating at an efficiency of 10, 20, and 30 lumens per watt is described. The same dry weight of tissue was produced in each case if the visible energy at the soil level was kept the same by raising or lowering the lamps. A 10 l.p.w. lamp at 33.5 in. was equal to a 30 l.p.w. lamp at 57.5 in. The dry weight of plant tissue produced was closely related to the output of a lamp in the visible region—(*Courtesy Biol. Abs.*)

Photodynamically induced tropisms in plant roots, H. F. Blum and K. G. Scott (*Plant Physiol., 8 (1933), No. 4, pp. 525–536, figs. 4*).—The phototropic bending in the roots of wheat seedlings, described from studies at the University of California, seemed due to the combined effect of reaction to light and the dark reaction of erythrosin. The wave lengths of light producing the phototropic bending correspond to the absorption spectrum of the dye, indicating that the dye acts as a photosensitizer.

A respiration coenzyme, F. E. Allison, S. R. Hoover, and D. Burk (*Science, 78 (1933), No. 2019, pp. 217, 218*).—The discovery of a heat-stable factor, designated as coenzyme R and essential for the respiration and indirectly for the growth of certain species of legume nodule bacteria (*Rhizobium*) is reported, and many of its chemical properties are given. It is widely distributed in nature and also synthesized by *Azotobacter*.—(*Courtesy Biol. Abs.*)

Root nodule formation on the garden bean, studied by a technique of tissue culture, K. H. Lewis and E. McCoy (*Bot. Gaz., 95 (1933), No. 2, pp. 316–329*).—In two series of experiments involving approximately 350 root systems, it has been shown that root nodule bacteria (*Rhizobium phaseoli*) will produce morphologically normal nodules on (1) excised roots (grown alone or in combination with etiolated whole plants or tops with adventitious roots), (2) etiolated tops having adventitious roots only, and (3) etiolated whole plants of a common variety of garden bean (*Phaseolus vulgaris*). The etiolated tissues were obtained from sterile seed and grown aseptically on a nutrient salts agar containing also 0.5 percent sucrose. They were kept in complete darkness for from 24 to 27 days. Such a technic of culture is of interest, since it offers a new approach to problems of infection and nodule development induced by the rhizobia.—(*Courtesy Biol. Abs.*)

A rapid method for identifying the bacteria in nodules of legumes, F. M. Clark and R. Hansen (*Soil Sci., 36 (1933), No. 5, pp. 369–374*).—A rapid and dependable method for identifying the organisms in nodules of legumes is described from the University of Illinois, using the nodule contents as antigen in agglutination reactions according to the rapid method of Huddleson and Abell (E.S.R., 59, p. 78). This method is of particular value in verifying the results in cross-inoculation experiments where strains of different serological behavior are used. Employing this technic, studies were made on the dalea-navy bean and soybean-cowpea crosses and results obtained which confirmed those previously reported.—(*Courtesy Biol. Abs.*)

The determination of the solanine content of plants with the aid of Cladosporium fulvum [trans. title], L. S. Agerberg, R. Schick, M. Schmidt, and R. von Sengbusch (*Züchter, 5 (1933), No. 12, pp. 272–280, figs. 6*).—Variations observed in the germination and the type of growth of *C. fulvum* spores placed on an agar medium containing different strength concentrations of solanine-containing plant material indicated that the reactions might serve as a measure of the solanine content of various species and of different portions of the same plant. In strong solanine decoctions there was no germination of spores, while in weaker concentrations germination occurred but the subsequent growth was thick, dwarfed, and much branched instead of the normal long, slender, and little branched form. Tests of leaves of over 100 tomato varieties showed all to be relatively rich in solanine, particularly in the actively growing tissues. The value of the spore test as an adjunct to breeding studies is suggested.

Methods for preserving plants in their natural form and colour, Abdel-Ghani Seif-El-Nasr (*Egypt. Min. Agr., Tech. and Sci. Serv. Bul. 124 (1932), pp. [3]+14, pls. 4*).—The author obtained the best results by immersing plants in 1 to 10 percent $CuSO_4$ in distilled water for varying periods of time (1 to 2 days is given in one recipe). The specimens are then rinsed and left in water for 24 hours and immersed in a solution of 16 cc commercial sulfuric acid, 21 g sodium sulfite, and 1,000 cc water. The jars in which the specimens are to be kept should then, while still in the second solution, be carefully sealed with seccotine, followed by a combination of yellow wax 210 g, Venetian turpentine 700 g, and vaseline 100 g. After the seal is dry (in about 2 days) "the excess should be removed with a knife and the lid 'passepartouted' to the jar." Specimens thus treated should keep form and color for years. The sealing should be carefully done, or the specimen will decay.—(*Courtesy Biol. Abs.*)

GENETICS

The scientific basis of evolution, T. H. Morgan (*New York: W. W. Norton & Co., 1932, pp. 286, figs. 42*).—A popular presentation of the elements of genetics.

The genetics and cytology of some interspecific hybrids of Avena, J. Philip (*Jour. Genet., 27 (1933), No. 1, pp. 131–179, pl. 1, figs. 10*).—The inheritance of certain characters was studied in the F_1 and F_2 of crosses made by C. L. Haskins between *A. fatua* and *A. sativa*.

The two plants of *A. fatua* used in reciprocal crosses with Banner oats (*A. sativa*) and *A. sativa gigantica* evidently were of the constitution $\overset{\frown}{cs}\ \overset{\frown}{cs}\ \overset{\frown}{BP}\ \overset{\frown}{BP}\ GG\ P'\ P'\ aa$ and $\overset{\frown}{cs}\ \overset{\frown}{cs}\ \overset{\frown}{BP}\ \overset{\frown}{BP}\ gg\ p'\ p'\ AA$, respectively, while the *A. sativa* forms were of the constitution $\overset{\frown}{CS}\ \overset{\frown}{CS}\ \overset{\frown}{bp}\ \overset{\frown}{bp}\ gg\ p'\ p'\ AA$. *C* is a factor for the type of basal articulation of the lower kernel with which seven other characters, including those of the upper kernel, completely correlated. *B* for black kernel color is epistatic to *G* for gray kernel color; *bg* together give white kernels; and *B*, *G*, and *C* are independent of one another. Black grain color and pubescence (*P*) on the back of the lower grain are completely correlated. *P'*, a factor for pubescence on the back of the lower grain, is independent of *B* and *G*, while *bg* inhibits pubescence on the back of the lower grain. *S*, a factor inhibiting pubescence on the back of the lower grain, is completely or almost completely correlated with the base type; *s* is only effective if hairs are present on the back of the lower grain. *A* for short hairs as opposed to *a* for long hairs is independent of the other factors. Modifying factors were shown to affect the expression of base type, awns, pubescence, and color, and the parents differed with regard to these modifiers. Twenty-one bivalents were generally formed at meiosis of the hybrids, although some irregular pairing occurred.

The data and evidence of the breakdown of shift are involved in a discussion on the evolution and relationship of hexaploid oat species.

Studies on the inheritance of covered smut reaction, lemma color, awn development, and rachilla pubescence in oats, L. P. V. Johnson (*Canad. Jour. Res., 9 (1933), No. 6, pp. 519–541*).—A genetic study of certain kernel characters and reaction to *Ustilago levis* in Black Mesdag × Victory was made at the University of Alberta. Black Mesdag and Victory, respectively, have black and white grains, strong and weak awns, pubescent and glabrous rachillas, and high and low resistance to smut infection.

Hybrid susceptibility, up to 95 percent, corresponded with that of the nonresistant Victory. Segregation among F_3 families occurred in the ratio 4 immune : 9 moderately resistant : 3 susceptible. Smut resistance seemed to be conditioned by one dominant factor, which when homozygous gives high resistance or immunity, and a less potent supplementary factor. Each of the grain characters studied was found to be controlled by two genetic factors, F_2 segregations ratios being for lemma color, 12 black : 3 gray : 1 white; awn development, 12 strong : 3 intermediate : 1 weak; and rachilla pubescence, 12 long : 3 short : 1 glabrous. No correlations between smut reaction and grain characters were found.

Inheritance of resistance to bunt, Tilletia tritici, in Sherman and Oro wheat hybrids, F. N. Briggs (*Genetics, 19 (1934), No. 1, pp. 73–82, figs. 3*).—Sherman and Oro wheats, according to studies at the University of California, differ from the susceptible variety Baart in one major factor for resistance to bunt. The factor in Sherman was identified as the Martin factor and the one in Oro as the Turkey factor. The genetic constitution of 10 bunt-resistant varieties studied is shown. Martin, White Odessa, Banner Berkeley, Odessa, and Sherman depend on the Martin factor *M* for resistance to bunt. Hussar has the Hussar factor *H* and the *M* factor, while Selections 1418 and 1403 from Hussar × Hard Federation have only the *H* factor. The varieties Turkey 1558, Turkey 3055, and Oro have only the Turkey factor *T*. See also earlier notes (E.S.R., 67, p. 140; 68, p. 342).

Conjugation in Rhizopus inhibited by female sex hormone, G. W. Plumb and L. W. Durrell (*Science, 78 (1933), No. 2026, p. 386*).—In tests at the Colorado Agricultural College with over 300 cultures of *R. nigricans*, the oestrin or female hormone prepared from human pregnancy urine inhibited zygospore formation while accompanying untreated check cultures conjugated profusely.

The association of non-homologous parts of chromosomes in the mid-prophase of meiosis in Zea mays, B. McClintock (*Ztschr. Wiss. Biol., Abt. B, Ztschr. Zellforsch. u. Mikros. Anat., 19 (1933), No. 2, pp. 191–232, pls. 6, figs. 51*).—The association of chromosomes at pachytene in corn, as shown by studies at the University of Missouri and the California Institute of Technology, is 2-by-2, whether or not the parts associated are homologous. Evidence for nonhomologous association of parts of chromosomes was obtained from monoploids, diploids, monosomics, trisomics, deficiencies, inversions, translocations, ring-shaped chromosomes, "asynaptic" plants, and so-called B-type chromosomes. The nonhomologous association, present at pachytene, rarely continued into diakinesis; in many cases it appeared to be as intimate as homologous association. Translocations seemed probably to result from the association of nonhomologous parts of chromosomes.

Inheritance of seed color in crosses of brown-seeded and white-seeded sorghums, J. B. Sieglinger (*Jour. Agr. Res. [U.S.], 47 (1933), No. 9, pp. 663–667*).—Inheritance studies with three crosses between brown-seeded and white-seeded sorghums indicated that the brown seed color of Scarborough broomcorn, darso, and Sumac sorgo is the result of two seed-color factors, *B* and *R*. In the F_2 of crosses between the brown-seeded and white-seeded sorghums, the ratio 12 brown : 3 yellow : 1 white-seeded plant was obtained. The awnless condition in Blackhull kafir is dominant to awning in darso, a segregation into 3 awnless : 1 awned being observed in F_2, but no linkage of the seed color and awn factors was apparent. In the F_2 of Blackhull kafir × Sumac sorgo, yellow stigma was completely associated with the presence of *R*.

Linkage relations of growth habit in tomato plants, T. M. Currence (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 501–504*).—Hybridization studies at the University of Minnesota with tomatoes of the determinate and indeterminate types of growth indicated that the governing character is a simple Mendelian gene and that determinate condition is recessive. Based on F_3 and back-cross data, evidence was secured that the determinate growth habit is linked with leaf type with a cross-over value of from 2 to 4 percent. The early ripening of fruit and determinate growth habit tended to remain together after crossing, but whether determinate plants were earlier because of the position of the fruit on the plant or for genetic reasons was uncertain.

The comparative anatomy of the stems of Betula pumila, Betula lenta, and the hybrid Betula jackii, S. M. Cousins (*Jour. Arnold Arboretum, 14 (1933), No. 4, pp. 351–355*).—Several distinctive anatomical differences were found between *B. pumila* and *B. lenta*. The hybrid birch *B. jackii* appeared intermediate in some characters, namely, size and distribution of vessels, width in cells of compound rays, and proportions and wall characteristics of pith cells. In other characteristics the hybrid resembled the respective parents.

Chromosome number in Acer and Staphylea, R. C. Foster (*Jour. Arnold Aboretum, 14 (1933), No. 4, pp. 386–393, pl. 1*).—Chromosome determinations made on the meiotic stages of 13 species and varieties of *Acer* and 4 species of *Staphylea* showed 13 as the basic number in both genera. Polyploids were observed in each genus. *Staphylea* chromosomes were larger than those of *Acer* but showed the same low chiasma frequency, regularity of behavior, and secondary pairing. In 45 of 53 species and varieties of *Acer* there was recorded more than 80 percent of viable pollen.

Chromosome number and relationship in the Magnoliales, T. W. Whitaker (*Jour. Arnold Arboretum, 14 (1933), No. 4, pp. 376–385, pl. 1, figs. 4*).—In the Magnoliales investigated there were noted two lines of cytological development with basic chromosome counts of 19 and 14, respectively. In the first group occurred *Magnolia*, *Liriodendron*, *Cercidiphyllum*, *Drimys*, *Trochodendron*, and *Tetracentron*. In the second were *Illicium*, *Schisandra*, *Kadsura*, and *Euptelea*.

Chromosome number and morphology in the conifers, K. and H. J. Sax (*Jour. Arnold Arboretum, 14 (1933), No. 4, pp. 356–375, pls. 5, figs. 3*).—The number of chromosomes was determined in 53 species representing 16 genera of conifers. Among species with 12 pairs of chromosomes were *Picea*, *Tsuga*, *Abies*, *Larix*, *Pinus*, and *Cedrus*. There were 11 pairs in *Thuja*, *Juniperus*, *Chamaecyparis*, *Taxodium*, and *Taiwania*. *Sequoia sempervirens* was found to be a polyploid, but the exact number of chromosomes was not ascertained. Determinations of chiasma frequency and the behavior of the chromosomes at meiosis in 22 species showed an average number of chiasmata per bivalent ranging from about 2 to 2.7.

Method of measuring linkage in human genetics, with special reference to blood groups, A. S. Wiener (*Genetics, 17 (1932), No. 3, pp. 335–350*).—A method of measuring linkage that may be applied in human genetics is described. When applied to the inheritance of the blood groups, agglutinogens *M* and *N* and agglutinogens *A* and *B* seemed to be independently inherited.

[Studies in animal genetics at the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 94, 95, 111, 112*).—Brief reports are presented of progress on investigations on the breeding of hogs resistant to cholera, by E. Roberts and W. E. Carroll; the histological basis for hairlessness in rats and swine, by Roberts and Carroll in cooperation with L. T. David of the [Connecticut] Storrs Experiment Station; and inheritance of broodiness and lack of broodiness in White Leghorn and Dark Cornish fowls and effect on egg production of crossbreeding low-producing White Leghorns and Rhode Island Reds, both by Roberts and L. E. Card.

Cattle inheritance.—I, Color, H. L. Ibsen (*Genetics, 18 (1933), No 5 pp. 441–480*).—An account is given of the understanding of the inheritance of various color characters in cattle, including the genetic composition of the common pure breeds. Several somatic color mutations are described in an attempt to explain them.

On the genetic constitution of Jersey cattle, as influenced by inheritance and environment, J. W. Gowen (*Genetics, 18 (1933), No. 5, pp. 415–440, figs. 4*).—Linear correlations were calculated for the weight, height at withers, heart girth, paunch girth, width at hips, body length, and rump length between sires and daughters, dams and daughters, and full and half sisters of Jersey cattle, from records obtained on more than 6,000 cows and 300 bulls from herds located in 15 different States. From these data an attempt was made to determine the relative influence of heredity and environment in determining these characters in Jersey cattle. The results were interpreted to indicate that inheritance accounted for most of the variations in size, and that such environmental differences as existed played only a small part in the ultimate size of the animals. High coefficients of assorted matings, especially in hip width and body and rump length, indicated the practice of separating Jersey cattle into noninterbreeding groups characterized by a definite type.

Residual variation was reduced in the cattle of any one herd nearly to the full measure of hereditary control, and further selection within herds appears to be limited to the more refined points or crosses between families of desired types.

Inbreeding Berkshire swine, E. H. Hughes (*Jour. Heredity, 24 (1933), No. 5, pp. 199–203, figs. 2*).—Inbreeding Berkshires, mainly by litter mate matings, at the California Experiment Station did not result in a decrease in litter size. The average litter size in 71 noninbred litters from 1919 to 1926 was 8.14 pigs, as compared with 9.78 per litter, from 18 inbred sows, during the period 1922 to 1931. The type of inbred pigs was relatively uniform, and no abnormalities or color changes were observed. There was some indication of reduced litter size produced at first parity by two sows of the tenth inbred generation.

A linebreeding program for horse breeding, P. B. Pearson and J. L. Lush (*Jour. Heredity, 24 (1933), No. 5, pp. 185–191, figs. 4*).—A description is given of the linebreeding plan being practiced by C. G. Good, of Ogden, Iowa, to maintain a high relationship in his horse breeding herd to the Belgian stallion Farceur. The plan is based on the maintenance of two lines with the mating of stallions produced from one line to mares produced in the other. Theoretical relationships are discussed, and it is noted that the plan has been closely followed. Individuals of excellent quality and uniformity occurred in the three generations which have been produced after Farceur and foundation mares.

Allelomorphism of silver and Siamese coat variations in the domestic cat, C. E. Keeler and V. Cobb (*Jour. Heredity, 24 (1933), No. 5, pp. 181–184, figs. 2*).—The results of several matings in cats, involving the factors for tabby (T), full color (C), silver (C^{ch}), and Siamese (cH), are reported. The offspring produced from these matings showed that silver and Siamese were due to allelomorphic genes in the albino series and correspond in their mode of inheritance to Chinchilla and Himalayan, respectively, in the rabbit, color characteristics which they resemble.

Inheritance of wildness and tameness in mice, W. M. Dawson (*Genetics, 17 (1932), No. 3, pp. 296–326, figs. 7*).—The characters wildness and tameness in mice were measured by the time required to traverse a 22-ft. runway when the mice were liberated, in studies at the University of Illinois. Wild male mice required 6.7±0.2 sec., while tame male mice required 24.5±0.65 sec. to travel voluntarily over this runway. Similar differences were observed in females, wild females requiring 5.3±0.17 and tame females 25.4±0.83 sec. The F_1s showed about the same degree of wildness as the wild stock. Segregation was apparent when F_1s were mated inter se or back-crossed to the tame stock.

The characters seemed to be largely controlled by 2 or 3 genes, and wildness was almost completely dominant. There was no evidence of linkage relationship between these genes and sex, albinism, pink eye, agouti, brown, or short ear.

Genetic constitution in mice as differentiated by two diseases, pseudorabies and mouse typhoid, J. W. Gowen and R. G. Schott (*Amer. Jour. Hyg., 18 (1933), No. 3, pp. 674–687, figs. 2*).—The data presented by the authors show that "the ability to survive a given inoculation of the virus of pseudorabies is markedly influenced by the genetic constitution of the animal. Susceptibility shows some tendency to be dominant in the F_1 cross. Comparison of a line which was resistant to pseudorabies and another which was susceptible for their respective resistances to another disease, mouse typhoid, showed their reactions to this second disease completely reversed. The F_1 cross for this second disease now show susceptibility largely recessive. These facts lead to the conclusion that genetic constitution as it is related to resistance to these diseases is perhaps best regarded as a composite of several distinct genes, some favoring resistance or susceptibility to one environmental agent and some another."

A genetic analysis of dissimilar carcinomata from the same gland of an individual mouse, A. M. Cloudman (*Genetics, 17 (1932), No. 4, pp. 468–480*).—Studies of the growth of three transplanted carcinomata from the mammary gland of a family of a highly inbred strain of mice showed that the susceptibility of different hosts to this tumor was apparently determined by two dominant susceptibility factors present in the inbred stock in a homozygous condition. The individual tumors seemed to differ as regards the susceptibility factors needed for successive growth on a host.

Inheritance of resistance to fowl paralysis (neurolymphomatosis gallinarum), J. Biely, V. E. Palmer, I. M. Lerner, and V. S. Asmundson (*Science, 78 (1933), No. 2011, p. 42*).—Marked differences in resistance of different strains of fowls to fowl paralysis were observed in studies at the University of British Columbia. In one study with 202 chicks, one half were inoculated at from 1 to 7 days of age with tissue from paralyzed birds, but 31.4 percent developed paralysis in those which were not inoculated as well as in those which were inoculated.

Family differences, from no paralysis to exhibits of ratios of 1:1 and 3:1 among the paralyzed chicks from different families, were observed.

Factors influencing the functional development of the male gonad, J. M. Robson and H. Taylor (*Roy. Soc. [London], Proc., Ser. B, 113 (1933), No. B 782, pp. 251–267, pl. 1*).—In studying the factors influencing the morphological changes and secretory activity of the testes, the influence of injections of the anterior lobe of the pituitary, suprarenal, pregnancy urine, etc., was studied with 317 rats ranging from 3 to 4 weeks of age. Litter mates were used as controls in each case. From the results it appeared that injection of the anterior lobe substance seemed to retard spermatogenesis. Other substances either inhibited or did not generally stimulate testicular development, although an increase in the weight of the testes resulted from the use of extracts of pregnancy urine.

Further considerations of the properties of the gonad-stimulating principle of mare serum, H. H. Cole, H. R. Guilbert, and H. Goss (*Amer. Jour. Physiol., 102 (1932), No. 1, pp. 227–240, figs. 3*).—In further studies at the California Experiment Station of the influence of the gonad-stimulating hormone of mare serum on the genitalia, it was found that immature male rats showed marked responses in the seminal vesicles and prostate, and the testes were approximately doubled in size. The seminal vesicles and prostate of mature male rats on a low-protein diet showed some stimulation of growth, but on a normal diet these males showed little change beyond some increased secretory activity. Impotency on the low-protein diet was temporarily cured by injections of the hormone. Injections of small doses of the hormone into immature females produced ovulation, but with larger doses several corpora lutea atretica were formed.

Chemical studies showed that the hormone was relatively stable in acid and alkali solutions of serum from pH 2 to pH 10 and was not easily destroyed by oxidation or pepsin.

The effect of progestin-containing extracts of corpora lutea on uterine motility in the unanesthetized rabbit, with observations on pseudopregnancy, S. R. M. Reynolds and W. M. Allen (*Amer. Jour. Physiol., 102 (1932), No. 1, pp. 39–55, figs. 3*).—Extracts of the corpora lutea of swine containing progestin were found to inhibit oestrous motility and prevent motility of the uterus of rabbits following the intravenous injection of theelin. The hormone responsible for the inhibition seems similar to, if not identical with, progestin.

On the interaction of oestrin and the ovary-stimulating principles of extracts of the urine of pregnancy, O. S. Baum and G. Pincus (*Amer. Jour. Physiol., 102 (1932), No. 1, pp. 241–248*).—The results from injections of oestrin and follutein (a preparation of the hypophyseal hormones obtained from the urine of pregnant women) into ovariectomized mice indicated that these hormones were antagonistic. The ovary-stimulating hormone, antuitrin S, had a similar effect, but no definite suppression on the ovaries of immature mice injected with 10 or 20 mouse units of oestrin was observed from 4 mouse units of follutein. It is suggested that hormonic antagonism and interaction be studied by extirpation of the gland, replacement therapy by injection of the hormone of the gland, and subsequently simultaneous injection of other hormones to determine which suppress and which enhance the effect of the first hormone.

A test for the demonstration of estrin in the blood of women, C. F. Fluhmann (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 1, pp. 54, 55*).—The induction of mucification of the vaginal mucosa of adult spayed female mice was found to furnish a sensitive test for the presence of oestrin in the blood of women.

Vitamin E and pituitary hormone, I, II, F. A. Diakov and J. Krizenecky (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 1, pp. 58, 59; 59, 60*).—Two papers are given.

I. *Failure of vitamin E preparations to induce precocious sexual development.*—In order to support or disprove the suggestion that extracts of wheat germs containing vitamin E, administered intraperitoneally or subcutaneously, give the same biological reaction as the hormone of the anterior lobe of the pituitary gland, vitamin E preparations were administered to immature rats. When administered intraperitoneally, the preparations proved toxic and in no case were signs of hastened sexual maturity observed. As a control for the above experiments prolan A from pregnancy urine hastened maturity by bringing about the ripening of follicles, opening of the vagina, and considerable hyperemia and hypertrophy of the labiae vaginalis, uterus, and tubes.

II. *Failure of ant. pituitary hormone and prolan A to substitute completely vitamin E.*—Confirming the above tests, it was found that neither pituitary hormone nor prolan A could replace vitamin E in the ration of an adult female rat. The hormone preparations favored ovulation, implantation of the fertilized egg, and early embryonic development, but vitamin E was necessary for further development and the completion of gestation.

Effect of hypophysectomy upon pregnancy and lactation in mice, H. Selye, J. B. Collip, and D. L. Thomson (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 1, pp. 82, 83*).—In these tests six mice 3 months old were hypophysectomized on the second and fourth days of lactation, and milk secretion failed. In six mice hypophysectomized during the second half of pregnancy normal litters were born but died a few days after birth. However, 22 out of 24 rats hypophysectomized during gestation bore living young. In mice hypophysectomy results in the rapid regression of corpora lutea, whereas in the rat they preserve their normal appearance for a considerable time.

Hypophysectomy in the pregnant rat, R. I. Pencharz and J. A. Long (*Amer. Jour. Anat., 53 (1933), No. 1, pp. 117–139, pls. 2, figs. 2*).—Studies of the effect of removal of the anterior and posterior lobes of the hypophysis of 93 rats at from the fourth to twenty-first day of gestation are reported. Pregnancy proceeded normally and the young were suckled in 19 of the 26 animals in which the glands were incompletely removed. When the operation was performed on the fourth day of pregnancy implantation failed, and in those operated on between the seventh and tenth day of gestation resorption followed within from 24 to 72 hr. Where complete hypophysectomy was performed between the eleventh and twentieth day of pregnancy the gestation period was prolonged and the mother died, or the young were not suckled or were born dead. Normal parturition followed the removal of the hypophysis on the twenty-first day of gestation. Mammary development continued and normal corpora lutea were found in hypophysectomized animals, but in no case was milk secreted.

Effects of feeding sodium bicarbonate or lactic acid upon the sex ratio in rats, F. E. D'Amour (*Science, 79 (1934), No. 2038, pp. 61, 62*).—Studies were made of the influence on the sex ratio of rats of feeding rations containing 2.5 and 5 percent of sodium bicarbonate or lactic acid prior to and during gestation. A total of 168 females to 146 males was produced on the sodium bicarbonate rations and 170 females to 145 males on the lactic acid rations. It is concluded that at least in the rat the sex ratio is not affected by the feeding of a base or acid ration.

FIELD CROPS

Recent advances in agricultural plant breeding, H. Hunter and H. M. Leake (*London: J. & A. Churchill, 1933, pp. X+361, pls. 16*).—This book is an attempt to present in connected form the results of investigations that have advanced beyond limits of purely academic interest and have resulted in the introduction of improved varieties into general cultivation. Chapters with appropriate bibliographies are given on wheat, corn, oats, barley, rice, sorghum, sugarcane, forage grasses, red clover, white clover, peanuts, soybeans, cotton, flax, sisal, jute, New Zealand flax, potato, root crops, tobacco, coffee, tea, cacao, poppy, citrus fruits and allied genera, banana, rubber, coconut, oil palm, castor-bean, and sesame.

General agriculture and special crops of temperate, subtropical, and tropical countries, I, II, E. Leplae (*Traité d'agriculture générale et de cultures spéciales des pays tempérés, subtropicaux et tropicaux. Louvain: Libr. Univ., 3. ed., 1932, vol. 1, pp. VIII+672, figs. 110; 1933, vol. 2, pp.* [5]+*796, figs. 147*).—Volume 1 treats of the origin, history, and types of agriculture; climate; reproduction, heredity, growth, and composition of crop plants, and their tillage and cultural needs; crop pests; natural forage resources; and soils, soil fertility, and fertilizers. Volume 2 considers varietal improvement; pastures, meadows, and forage crops; and the production of cereal, fruit, fiber, oil seed, condimental, medicinal, and dye crops, and rubber and gums. A classified bibliography relating to crops grown in warm countries and a brief discourse on animal production are also included.

[Crops research of the U.S. Department of Agriculture, 1933] (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. 69–71, 95*).—Reports are given of the progress of breeding work with sugar beets, culminating in the development of strains resistant to leaf spot and to curly top; a new hybrid between Pima and Sakel Egyptian cottons; control of downy mildew of tobacco; breeding work with barley, oats, wheat, flax, corn, and peanuts; the use of crotalarias for soil improvement; the merits of Korean lespedeza; and variety, fiber, and spinning tests with cotton in cooperation with the South Carolina Experiment Station.

[Field crops research in Colorado] (*Colorado Sta. Rpt. 1933, pp.. 6, 7, 8, 9, 11*).—Continued agronomic studies (E.S.R., 68, p. 608) reviewed briefly dealt with control of bacterial wilt and winter-killing of alfalfa, the linkage relationships of barley, improved strains of corn and sorgo, Wallaby grass and teff grass for range improvement, and the deterioration of variously cured and stored alfalfa hay in quality and vitamin A content.

[Field crops research in Illinois], J. J. Pieper, W. L. Burlison, C. A. Van Doren, J. C. Hackleman, O. H. Sears, W. P. Flint, C. M. Woodworth, W. J. Mumm, G. H. Dungan, D. C. Wimer, E. E. De Turk, E. B. Earley, J. R. Holbert, O. T. Bonnett, and R. E. Fore (*Illinois Sta. Rpt. 1933, pp. 28–35, 36–44, 47–54, 54–57, 58–65, figs. 6*).—Progress reports of research with field crops (E.S.R., 68, p. 608) cover variety trials with corn, winter and spring wheat, oats, barley, buckwheat, alfalfa, red clover (strains), lespedeza, soybeans, pasture grasses, legumes and mixtures, seed flax, safflower, potatoes, and Jerusalem-artichoke; breeding work with corn for oil and protein content, wheat, oats, barley, soybeans, and Jerusalem-artichokes; improvement of corn by top crossing and by reconstitution; the inheritance of yield characters in oats, seed size in wheat, tillering in barley, and seed characters in soybeans; cultural (including planting) tests with corn, Sudan grass, soybeans, red clover, and Jerusalem-artichokes; nurse crop and cutting tests with red clover; effects of storage on germination of soybeans and on home-grown and northern-grown seed potatoes; effect of seed-coat injury to seed on yield of soybeans; analyses of yields of varieties of winter wheat, oats, and barley; fertilizer tests with corn; fertility value of cornstalk ash and residues and of straw for soil improvement; trials of methods for hand-pollinating barley; germination studies with soybeans; the response of red clover and lespedeza varieties to inoculation and a comparision of types of inoculants; control of quack grass by cultivation; tests of chlorates and other chemicals for weed and crop injury; life history and control studies with wild garlic and onions; production studies with crops relatively new to Illinois, including pyrethrum, safflower, Russian hemp, flax, buckwheat, and Jerusalem-artichoke; and the utilization of soybean oil in paints.

[Agronomic studies in England] (*Jour. Natl. Inst. Agr. Bot., 3 (1933), No. 3, pp. 227–319*).—Field crops research reported on included variety trials (1927–29) with winter wheat, winter barley, spring barley, and winter and spring oats, and the influence of the soil and the date of planting on these crops, by F. C. Hawkes; trials of sugar beet strains, 1930–32, by S. F. Armstrong, and of potato varieties, 1931–32, by W. H. Parker; tests of the quality for breadmaking purposes of wheats harvested in 1932, by A. and S. Humphries, and L. H. Read; and the Lord Derby Gold Medal potato trials, 1932, by Parker and H. Bryan. The methods used in variety trials are outlined briefly by Parker.

Fertilizing permanent pasture, F. A. Welton (*Ohio Sta. Bimo. Bul. 165 (1933), pp. 139–142, fig. 1*).—Old pasture on Wooster silt loam, largely Kentucky bluegrass with some white clover, was topdressed with limestone and fertilizers in April 1924 and four years later. The grass was mowed with a lawn mower and the dry weight determined. Limestone with superphosphate increased the mowed yield of dry matter 21 percent, as an average of seven years. The addition of potassium chloride and of both potassium chloride and ammonium sulfate to the same combination resulted in further gains of about 4 and 5 percent, respectively. The lawn mower method of harvesting evidently contributed to the death of much grass in the drought year of 1930. Superphosphate alone and the limestone-superphosphate combination increased the chemical constituents of the grass. Hogs breaking into the pasture plats in 1925 tore up the sod of the fertilized plats but avoided all the checks. In another test on a similar but poorer soil the superphosphate-limestone combination resulted in the invasion of considerable white clover in the second year after treatment.

The improvement of grass land (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 3, 4. ed., rev. (1933), pp. IV+68*).—A revised and enlarged edition of the publication noted earlier (E.S.R., 65, p. 527).

Alfalfa yellows, L. F. Graber and V. G. Sprague (*Science, 78 (1933), No. 2026, pp. 385, 386*).—The stunting and yellowing of alfalfa caused chiefly by leafhoppers (*Empoasca fabae*), appears primarily in the second growth in Wisconsin. That it is definitely associated with increased populations resulting from early cutting of the first crop was made clearly evident by cutting trials of alfalfa and population counts of leafhoppers during the past two years by the University of Wisconsin.

Corn culture, F. D. Richey (*U.S. Dept. Agr., Farmers' Bul. 1714 (1933), pp. II+26, figs. 16*).—Superseding Farmers' Bulletin 414 (E.S.R., 24, p. 236), this publication indicates the seed, soil, rotation, and fertility requirements of the corn crop and describes preparation, planting, and cultivation operations. Information is also given on insects injurious to corn by W. H. Larrimer, and on diseases of corn.

Effects of stress conditions on the cotton plant in Arizona, C. J. King (*U.S. Dept. Agr., Tech. Bul. 392 (1933), pp. 35, figs. 19*).—The effect of stress (E.S.R., 47, p. 133) and crazy-top (E.S.R., 57, p. 643) on Acala and Mebane upland cotton and Pima Egyptian are described from studies from 1926 to 1931 on the influence of unfavorable conditions on cotton plants in the Salt and Gila River Valleys of Arizona.

The irregular growth and development of the cotton plants were pronounced in those areas where unfavorable cultural conditions existed, particularly in impervious soil areas where proper moisture relations were not maintained. Many structural modifications and abnormalities were associated with the crazy-top disorder which is most prevalent under unfavorable conditions. However, modifications associated with water stress and crazy-top did not prove to be heritable. The upland cottons showed greater diversity in types of plants and bolls when affected by stress or crazy-top than did Pima cotton. Bolls on plants affected by either condition usually were reduced in size, contained fewer seeds, and were off-type or malformed. The lint was often weaker, shorter, less abundant, and more uneven in length than that developed on normal plants. The seeds on upland plants developed under water stress conditions were commonly reduced in size, and the amount of fuzz on seeds produced on different parts of the plants ranged widely. Under crazy-top conditions, a large proportion of the seeds was aborted. The fiber and seeds of Pima cotton were less affected by stress or crazy-top than those of upland varieties. Shedding of buds and young bolls was pronounced on both upland and Pima cottons under unfavorable conditions, and the plants often were sterile when severely affected with crazy-top.

Inspection of the cotton in the field and segregation of damaged from good fiber when harvesting are suggested as a practicable means of raising the quality standards of irrigated cotton. Cultural practices that effect a more uniform distribution of water in the soil, increase the water-absorbing capacity of the soil, and deepen the root zone, have proved beneficial in controlling water-stress effects and crazy-top.

Hard seeds and broken seedlings in red clover (Trifolium pratense).—IV, Early stages of germination (physical), A. Nelson and J. C. Macsween (*Bot. Soc. Edinb., Trans. and Proc., 31 (1932–33), pt. 2, pp. 247–255, figs. 3*).—In continued studies (E.S.R., 58, p. 430), red clover seed was replaced by horsebeans (*Vicia faba*) because of technic difficulties. The mechanism of water intake by the horsebean appeared to involve at least two mechanisms. The first of these is hydration of the colloids of the testa, and this is followed by an osmotic intake of water through the semipermeable membrane of the testa, the osmotically active substance being a reducing sugar formed from carbohydrate not in the embryo itself. Passage of water through such apertures as the micropyle or hilar slit is not significant if it occurs at all. These structures probably are concerned with ripening processes if they function after fertilization. It was evident that the individuality of each seed should be considered in any detailed study of germination.

Manurial experiments with guinea grass at Serdang, V. R. Greenstreet and J. L. Greig (*Malayan Agr. Jour., 21 (1933), No. 11, pp. 543–557*).—A progress report on fertilizer tests with guinea grass (*Panicum maximum*) indicates that the best results were had on heavy soils by fertilizing with basic slag and cutting at 3-week intervals. Superphosphate depressed the yield and the lime and phosphorus contents of the grass on heavy soil, and little or no response was made to nitrogen or potassium used in conjunction with phosphatic fertilizers. The yields and composition suggested that basic fertilizers are better than acid fertilizers, which in turn surpass cow manure. The treatments had little effect on raising the crude protein of the grass.

Lespedeza, A. J. Pieters (*U.S. Dept. Agr. Leaflet 100 (1933), pp. 8, figs. 2*).—The information presented on the characteristics and cultural, fertility, and management requirements of the annual common (*L. striata*) and Korean (*L. stipulacea*) and the perennial (*L. sericea*) lespedezas grown for hay, pasture, soil improvement, and seed production, supersedes that given in Farmers' Bulletin 1143 (E.S.R., 44, p. 37).

Studies on Pennisetum typhoideum (Rich.)—the pearl millet.—Part I, Anthesis, G. N. R. Ayyangar, C. Vijiaraghavan, and V. G. Pillai (*Indian Jour. Agr. Sci., 3 (1933), No. 4, pp. 688–694, pl. 1, fig. 1*).—Two-hour observations on a number of spikes of pearl millet during day and night in three seasons showed that maximum flowering occurs between 10 p.m. and midnight. During the day a second slight rise takes place prior to 10 a.m., while the least flowering is met at 4 p.m. Periods of high humidity and falling temperature are marked by increased anthesis. The flush of anthesis in staminate flowers overlaps the first flush of anthesis in hermaphrodite flowers. Individual flowers take about an hour for the exsertion and opening of anthers in day and about twice as long at night. The absence of lodicules disfavors rapid and concentrated anthesis, and the penicillate anthers appear to be an adaptation for anther protrusion.

Cultivated oats of U.S.S.R. [trans. title], M. F. Petropavlovskiĭ (M. T. Petropavlovsky) (*Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant-Breeding*), *1931, Sup. 45, pp. 138, figs. 35; Eng. abs., pp. 132–138*).—The current status of oats culture in the U.S.S.R. is outlined, the distribution and characteristics of important types and varieties are described, and the geographical variation of important botanical characters is discussed at some length. The tables and legends are bilingual.

Carbon dioxide storage v. breaking the dormancy of potato tubers, N. C. Thornton (*Contrib. Boyce Thompson Inst., 5* (*1933*), *No. 4, pp. 471–481, fig. 1*).—When dormant potato tubers were treated either cut or whole for from 3 to 7 days with 40 to 60 percent of carbon dioxide and 20 percent of oxygen at 25° C., they sprouted and 50 percent appeared above the soil in from 19 to 35 days, as compared with 60 or more days required for the control to emerge. The dormant tubers, stored for from 3 to 6 days in 100 percent nitrogen or carbon dioxide and then planted, sprouted faster than those held in 100 percent oxygen. Treatment for 3 days with a 60 percent carbon dioxide and 20 percent oxygen was more effective in producing sprouting than with either 0, 5, or 10 percent oxygen. Carbon dioxide increased the respiration rate of potato tubers as measured by the oxygen uptake. Treatment with from 50 to 70 percent carbon dioxide induced changes whereby the pH of the juice shifted from 0.6 to 0.7 of a pH unit toward alkalinity over that of the control. The reducing properties of the potato juice were increased greatly by the treatment. The glutathione content of the tubers decreased during the carbon dioxide treatment, but increased greatly over the control after planting.

Influence of the level of fertility on the optimum spacing for potatoes, P. H. Wessels (*Amer. Potato Jour., 11* (*1934*), *No. 1, pp. 17–20*).—A fertilizer-spacing test in 1932 with Green Mountain potatoes on Sassafras silt loam at the Long Island (N.Y.) Vegetable Research Farm gave results indicating that under existing conditions the fertility level, whether measured by crop yields or by fertilizer applications, did not influence the optimum spacing for maximum production of marketable tubers. A 9-in. spacing usually gave highest total yields, and in most cases 11-in. spacing returned the largest yields of marketable tubers.

Rice in British Guiana, 1927–1932 (*Brit. Guiana Dept. Agr., Rice Bul. 1* (*1933*), *pp. 60, figs.* [*16*]).—Research with the rice crop in British Guiana, 1927–32, comprised varietal and industrial investigations described by L. E. W. Codd and E. M. Peterkin, including breeding work and variety, machinery, and cultivation studies; fertilizer experiments by R. R. Follett-Smith; insect pests of rice and paddy by F. A. Squire, including storage of grain and characteristics of the rice stem borer (*Diatraea saccharalis* F.) and the white stem borer (*Scirpophaga albinella* Cram.); and notes on diseases of rice by E. B. Martyn.

Biometric studies in sorghum: The relation of yield to other characters in Andropogon sorghum, S. N. Venkataramanan and P. Subramanyam (*In-*

dian Jour. Agr. Sci., 3 (1933), No. 4, pp. 609–625, figs. 7).—As judged by their relation to the weight of the head of Pacha Jonna sorghum from plant to plant, circumference of head, diameter of peduncle, length of head, and height of plant, were, in the order of importance, positively related to yield, while the extent of emergence showed a negative relation. The relation also held true to a lesser extent from type to type. The relations of circumference of and length of head and diameter of peduncle to yield were nearly rectilinear, showing a proportional increase or decrease of weight of head with changes in these characters. Plants with very high emergence or length of peduncle tended to produce very small earheads. Considering their independent contributions, circumference of head showed the greatest relation with yield, while the effects of diameter of peduncle, height of plant, or emergence were variable from field to field, and length of head was of small order. The circumference of head gave a fairly close indication of yield, and to a smaller extent the length of the head. Part of the relationship noted was the result of developmental variation associated with certain environmental factors.

Chlorophyll content of grain sorghums, J. C. Ireland and P. A. Yeats (*Bot. Gaz., 95 (1933), No. 2, pp. 300–315, pl. 1, figs. 3*).—The chlorophyll content in kafir, based upon weekly determinations at the Oklahoma Experiment Station, increases generally to the seed maturity stage in the plant, but it begins to decrease as the grain hardens. It varies directly with the amount of evaporation and with the temperature. A positive correlation was noted between the chlorophyll content and yield of kafir. Varietal differences in the chlorophyll content seemed to be consistent throughout the growing season. Comparison of seasonal multiple correlation coefficients and their standard errors of estimate made it possible to reduce the latter appreciably. The elimination of indefinite factors by the scoring process and the addition of others aided in securing a higher correlation coefficient. For comparative purposes, the microspectroscope was found very effective in determining the relative concentrations of chlorophyll in kafir seedling leaves.

Suberization and wound-cork formation in the sugar beet as affected by temperature and relative humidity, E. Artschwager and R. C. Starrett (*Jour. Agr. Res. [U.S.], 47 (1933), No. 9, pp. 669–674, figs. 4*).—A study of the influence of temperature and humidity on the rate of suberization and wound-cork formation on sugar beets topped at different planes employed a method of procedure essentially the same as that in a study of wound-periderm development in sweetpotato and gladiolus (E.S.R., 66, p. 137). Roots of sugar beet were observed to respond to wounding by suberization of the cut surface and belated development of a shallow wound periderm. Suberization was very slight, involving at best only one or two layers of cells, and if temperature and relative humidity were unfavorable it was found only in the outer wall. Under favorable conditions, a very shallow wound periderm developed as early as 10 days after wounding. Little difference was noted in the healing of wounds in beets cut through the crown, neck, or tap region, and the relative scarcity of decay in beets topped through the crown probably was linked with the specialized anatomical structure of this region. The tissues bordering bore holes made through beets became lignified and slightly suberized, and there also was slight localized periderm formation.

Experiments on depth of plowing and of planting sugarcane, 1908–32 [trans. title], E. Demandt (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1933, No. 14, pp. 605–630; abs. in Facts About Sugar, 28 (1933), No. 10, p. 397*).—Review of 322 depth-of-plowing tests for sugarcane in Java showed cane yields to increase with plowing depths down to 30 cm, with a decrease below 30 cm. Deep plowing was especially effective on the heavier soils and on soils with good water-holding capacity. The deeper plowing increased cane yield but depressed sugar yield, while the number of stalks remained about the same. Survey of 312 depth-of-planting tests indicated that yield rose with depths down to 20 cm, while below 30 cm yield decreased. Deeper planted cane produced fewer stalks, but resisted lodging better.

Windrowing qualities of Co. 281 and other varieties of sugarcane under Louisiana conditions, R. T. Balch and J. I. Lauritzen (*U.S. Dept. Agr. Circ. 304 (1933), pp. 15, fig. 1*).—In tests during the 1930–32 seasons at Houma, La., the excellent keeping qualities of Co. 281, when windrowed, suggested that it should be valuable for Louisiana planters. Co. 281 deteriorated less than P.O.J. 36–M and practically equaled D. 74. The tests showed that deterioration in unfrozen cane is the loss of sucrose due to inversion, because, excluding loss of sugars due to respiration, this is the principal change occurring in the juice phase of sound cane after cutting. However, other reactions may be detected if cane is damaged by freezing or by insects, thereby permitting abnormal activity by micro-organisms.

The problem of frosted sugarcane [trans. title], W. E. Cross (*Bol. Estac. Expt. Agr. Tucumán, No. 22 (1933), pp. 31*).—A practical discussion of the causes of frosts and their effects on the sugarcane plant and stalks, remedial measures, decomposition and harvesting problems, and handling and utilizing frosted cane in the factory.

Structure and development of the tobacco leaf, G. S. Avery, Jr. (*Amer. Jour. Bot., 20 (1933), No. 9, pp. 565–592, figs 42*).—This second paper of a series on structure and development of *Nicotiana tabacum* (E.S.R., 69, p. 796) is confined largely to developmental morphology, considering the origin of tissues, the plane and direction of cell divisions and cell enlargement, the duration of such divisions and enlargement, and the resulting tissue strains and their influence on cell shape and character of tissues.

Varieties of common white wheat, J. A. Clark and B. B. Bayles (*U.S. Dept. Agr., Farmers' Bul. 1707 (1933), pp. II+22, figs. 11*).—The information given on the production areas, uses, and characteristics of the 44 varieties of white wheat grown commercially in the United States supersedes that reported in Farmers' Bulletin 1301 (E.S.R., 48, p. 835). Outstanding varieties include Goldcoin, Baart, Federation, Pacific Bluestem, and Dicklow.

Varieties of durum wheat, J. A. Clark (*U.S. Dept. Agr., Farmers' Bul. 1706 (1933), pp. II+13, figs. 6*).—Production areas, uses, and the 10 varieties of durum wheat grown commercially in the United States are described, superseding the information given in Farmers' Bulletin 1304 (E.S.R., 49, p. 37).

The wheats of Syria, Palestine, and Transjordania, cultivated and wild [trans. title], M. M. I͡Akubtsiner) (Jacubziner) *Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant Breeding, 1932, Sup. 53, pp. 276, figs. 77; Eng. abs., pp. 207–266*).—Species and varieties of wheat grown in these countries are described and classified with appropriate determinative keys. Information is also provided on the status of wheat growing and the altitudinal distribution of species and groups, and available literature is reviewed.

Estimation of wheat production possibilities in the Panhandle of Oklahoma, H. H. Finnell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 52 (1933), pp. 22–36*).—A statistical determination of factors affecting wheat yield was made with data from 60 crops of wheat grown on heavy silt loam soil at Goodwell, Okla., and the accompanying soil and seasonal conditions during the decade 1924–33.

The spring growing conditions centering on May showed a predominating influence, as represented by wind velocity, which was associated with unfavorable rainfall, humidity, and temperature combinations at a critical period of the wheat season. Significant initial factors which could be measured before or at planting time were July rainfall (2.66 in.), fall soil moisture from 0 to 3 ft. (16.53 percent), topsoil nitrates (19.6 lb. nitrate nitrogen in 6 in. topsoil per acre), and raw organic matter in the topsoil (1,312 lb. unrotted residue per acre). The error of estimate, based on these four initial factors, was 313 lb. of grain per acre where the extreme variation in yield noted was 2,500 lb. When the mean values of the initial factors were set as division points between favorable and unfavorable indications, experience during the 10 years showed that three or more of the initial conditions must be favorable to insure against complete failure and produce more than average yields of wheat. The July rainfall and fall soil moisture were related positively to wheat yield, and soil nitrates and unrotted residues were related negatively

Local variation in protein content of wheat, 1932, H. H. FINNELL ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 52* (*1933*), *pp. 11–13, figs. 2*).—From continued studies on the protein content of wheat in the Panhandle (E.S.R., 66, p. 826), the distribution of high and low content of wheat in the years 1929–32 is indicated on outline maps. Observations during several seasons suggested that a general idea of probable source of high protein wheat may be gained from past protein surveys, but dependence can only be placed on the analyses obtained current with the movement of any given wheat crop.

The effect of nitrogen nutrition on the protein and non-protein nitrogen of wheat, A. G. MCCALLA (*Canad. Jour. Res.*, *9* (*1933*), *No. 6*, *pp. 542–570*, *figs. 9*).—Marquis wheat plants were grown in water cultures varying only in nitrogen in a study reported by the Universities of California and Alberta. The nitrogen as nitrate was supplied to half the plants continuously to maturity and to the others only until heading. Although uptake and reduction of nitrate continued in the first group for some time after heading, organic nitrogen produced in vegetative parts of the plant after heading was not synthesized to protein but accumulated as nonprotein compounds. Regardless of the extent of the nitrogen reserves in vegetative parts, translocation to the kernels during filling took place in about the same proportion. In plants with limited nitrogen supply, translocation to kernels consisted largely of decomposed proteins, and the kernels contained less gluten nitrogen than those of the plants with unlimited nitrogen which drew upon both protein and nonprotein reserves. The nitrogen fractions of the gluten proteins and the total amount of nongluten nitrogen apparently were unaffected by the nitrogen nutrition of the plants. Amide nitrogen was the most labile of the nitrogen fractions used.

Official Seed Testing Station for England and Wales: Fourteenth annual report, 1930–1931, A. EASTHAM (*Jour. Natl. Inst. Agr. Bot.*, *3* (*1933*), *No. 3*, *pp. 320–328*).—The average germination and purity are tabulated and discussed for 26,862 samples of agricultural seed received from various sources in these countries during the year ended July 1931.

HORTICULTURE

[**Horticultural studies in Colorado**] (*Colorado Sta. Rpt. 1933*, *pp. 16–19*).—Progress statements are made on studies of orchard management; the growing of vinifera grapes; varieties of pears for Delta County; the development of tipburn-resistant lettuce; the breeding of Sweet Spanish onions; the storage of onions; and the culture of raspberries.

Fermenting cornstalks as a substitute for manure in hotbeds, E. M. EMMERT (*Amer. Soc. Hort. Sci. Proc.*, *29* (*1932*), *pp. 493–495*).—Trials at the

Kentucky Experiment Station of fermenting cornstalks as a substitute for horse manure for heating hotbeds indicated certain advantages for the cornstalks, such as greater uniformity of heat, provided the stalks were cut into short lengths and thoroughly wetted. Temperatures taken on cornstalk beds prepared in different ways showed that the addition of cottonseed meal and superphosphate to the cornstalks was highly desirable. Tomato plants started in cornstalk beds about the middle of March made desirable progress.

The temperature factor in the freezing preservation of fruits and vegetables, H. C. Diehl and J. A. Berry (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 287–290*).—Observations on a large variety of horticultural products stored in various type containers with temperatures ranging from —100° F. to 28° lead to the suggestion that satisfactory preservation was possible at temperatures centering about 0°. Among desirable contributory factors were the fairly rapid reduction of temperature, the kind of solution in which the product was placed, and the type of containers. The authors suggest that storage at 20° and 25° is unsuitable for most plant products packed in sirup or brine, and that 15° appears to be the practical upper limit. There appeared to be no practical advantage in holding the temperature much below 15° when the cost of maintaining low temperatures was balanced against resulting advantages.

Analyses of materials sold as insecticides and fungicides during 1933, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 556 (1933), pp. 18*).—As in other years (E.S.R., 68, p. 618), the results are presented of analyses of spraying and dusting materials collected during the inspection of 1933.

[Olericulture at the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 241–255, fig. 1*).—Information is presented on the results of studies by J. W. Lloyd, E. P. Lewis, L. H. Shropshire, W. A. Heulsen, W. H. Michaels, and H. M. Newell on the use of commercial fertilizer and stable manure in the economical production of truck crops; the relation of heavy cutting to the yield and quality of asparagus; improvement of cabbage, beets, and tomatoes by selection and breeding; variety tests of spinach and tomatoes; spraying v. dusting in the control of vegetable pests; top-crossing as a means of increasing yield and uniformity of sweet corn; sweet corn injury traceable to nitrogen fertilizers; fertilizing of hothouse tomatoes; and open packages as an aid in the cooling of transported fruits.

Bud pollination in cabbage and radish, Y. Kakizaki and T. Kasai (*Jour. Heredity, 24 (1933), No. 9, pp. 359, 360, fig. 1*).—Petsai, or Chinese cabbage, flowers self-pollinated artificially 2 or 3 days before they opened yielded at Saitama Agricultural Experiment Station, Japan, an average of 17.63 seeds per flower as compared with 0.13 seed for fully opened blossoms on the same inflorescences. In the radish the respective average numbers of seeds were 2.53 and 0.04. The theory that inhibiting substances are not yet developed in quantity in the stylar tissue of the unopened bud is discussed.

Similar results were obtained at the California Experiment Station with Copenhagen Market cabbage (E.S.R., 64, p. 34).

The effect of the duration of cutting season on asparagus that has been flooded, G. C. Hanna (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 466, 467*).—Records taken by the California Experiment Station on the production of Mary Washington asparagus fields flooded in midwinter to control the garden centipede, and thereby forced into growth from 10 to 14 days earlier than usual, indicated that the earlier production of the flooded areas was offset by an earlier cessation of worth while yields. The harmful effect of flooding apparently lay in prolonging the cutting season rather than in flooding injury itself.

The amount of blossom and pod drop on six varieties of garden beans, A. M. BINKLEY (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 489–492*).—Daily records taken at the Colorado Agricultural College on the number of blossoms formed on six varieties of beans showed considerable inherent differences in varieties with respect to dropping of blossoms and immature pods, ranging from 44.25 percent in Saddleback wax to 76.21 in Canadian Wonder. These varieties were also the highest and lowest yielders, respectively. Some relationship was evident between soil moisture and the abscission of flowers and pods.

Effects of the fertilizer treatment on the growth, yield, and quality of Henderson bush lima beans at successive stages of maturity, R. L. CAROLUS (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 445–450*).—Due apparently to the very meager rainfall in the spring months prior to planting and during the growing period, Henderson bush lima beans planted at the Virginia Truck Experiment Station on July 1 and 2 showed no marked response to variation in the basic fertilizer formula, namely, 4–4–8 (NPK). However, all fertilized plats produced more that the controls. Potassium had a beneficial influence on the quality of the marketable beans, apparently through its effect in retarding the rapid blanching of the seeds.

Effects of certain environmental conditions upon the growth habit of the Henderson bush lima bean, L. HAVIS (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 451–454, fig. 1*).—Considerable variation in type of growth, especially in height, was observed at the Ohio Experiment Station in bush lima bean plants thinned to 4, 10, 16, and 22 in. in the row. Plants shaded with two and three layers of cheesecloth bloomed only 1 day later than exposed plants, but under four layers there was a delay of 6 to 7 days and the flowering period was considerably lengthened. No consistent difference was observed in the number of internodes under the several coverings. That time of planting may be a factor in resulting type of growth was seen in the twining of the main axis of plants from seeds sown June 29 and not in earlier sowings. Soil reaction studies in the greenhouse indicated that pH values below 6 were harmful, resulting in brittle roots with few laterals. As aluminum sulfate was used to induce acidity, it is concluded that some of the harmful results in the low pH plats may have been due to aluminum toxicity.

The effect of kind of paper bags on the production of selfed table beet seed under bags, R. MAGRUDER (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 442–444*).—At Arlington Experiment Farm, Va., in the summer of 1932 considerable difference in yield of seed of Detroit Dark Red mother beets was found with relation to the type of bag used in covering the flowering branches; furthermore there was noted considerable difference in the viability of the seed produced. The average number of seedlings per seed ball was positively correlated with the percentage of germination.

Incompatibility in broccoli and the production of seed under cages, O. H. PEARSON (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 468–471*).—A description is given of a method designed by the California Experiment Station for obtaining small quantities of hybrid broccoli seed by inclosing honeybees with compatible plants beneath cheesecloth cages.

Chemical changes in carrots during storage, H. PLATENIUS (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 450*).—Repeated analyses of carrots held at 32°, 35°, 40°, and 50° F. showed a slight increase in the percentage of water, except in the 32° lot, during storage. Earlier in the storage period sucrose was converted to reducing sugar, but later the process was reversed.

The interrelation between the hydrogen-ion concentration of the soil and the growth rate of celery, M. M. PARKER (*Amer. Soc. Hort. Sci. Proc.,* *29 (1932), pp. 455–457).*—Applications at the Virginia Truck Experiment Station of hydrated lime at the rates of 1, 2, 3, 5, and 8 tons per acre to a soil originally of pH 4.5 changed the pH to 4.8, 5.2, 5.6, 6, and 6.8, respectively, and materially influenced the yield of Golden Plume celery otherwise abundantly supplied with nutrients. The maximum yield, as registered by weight of tops, was recorded at pH 6, with a diminution above and below that point. Plants in the pH 4.5 and 4.8 lots exhibited injury of roots and tops, and even at pH 5.2 the growth was subnormal.

Relation of temperature and length of day to type of growth in celery, cabbage, and beets, H. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 476*).—The holding of cabbage, celery, and beet plants at 60° to 70° F. was found by Cornell University to result in purely vegetative growth; in fact cabbage and beets held at medium and high temperatures remained vegetative for 3 years, and the type of growth of celery and cabbage could be influenced at will by modifying the temperature. In beets the control of temperature and photoperiod gave similar results.

An hereditary pithiness in celery, S. L. EMSWELLER (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 480–485, figs. 2*).—The progeny of two hollow-petioled celery plants of the Utah variety, flowered at the California Experiment Station in heavy muslin cages, was nearly three fourths hollow petioled in each case, indicating that pithiness of the type observed is due to a single dominant gene. Since similar results were secured in the greenhouse and outdoors, it was evident that low temperature had no effect on expression of the gene controlling pithiness. At the same time other lines grown from solid-stalk parents contained all solid progeny. Solid petiole being recessive suggests that the elimination of all pithy plants from seed beds should lead to complete freedom from this objectionable feature. A microscopic study of pithy petioles showed that breakdown of the parenchyma occurred in the center of the petiole.

Nodal sequence of flower type in the cucumber, T. M. CURRENCE (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 477–479, fig. 1*).—In this study, carried on at the West Virginia Experiment Station, counts were made and the sex reported of the flowers of each node of three varieties of cucumber the seeds of which were sown June 12. A distinct change in the numerical relationship of pistillate and staminate nodes was observed as the plants developed, the tendency being a gradual change from a strongly staminate to a strongly pistillate condition. There was a corresponding increase in fruit set as the vines lengthened. Calculation of the coefficient of correlation between length of vine expressed in number of nodes and the average number of staminate flowers per staminate node gave 0.3±0.06, 0.15±0.06, and 0.59±0.05 for Davis Perfect, Arlington White Spine, and Cumberland Pickling, respectively.

Influence of fertilizer treatment on lettuce head and seed production, L. L. CLAYPOOL (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 438–441*).—Of the three nutrients, nitrogen, phosphorus, and potassium, nitrogen proved to be the most important limiting factor for lettuce of the Iceberg type grown on a fine sandy loam at the Irrigation Substation, Prosser, Wash. Data taken on both the heads and on the seed showed the same trends, there being a positive correlation between the size of heads and the number of flowers produced on the seed stalk. Phosphorus proved beneficial when used with nitrogen, but the addition of potash to the nitrogen and phosphorus combination did not give significantly increased yields of lettuce or seed. In one year (1932) the check plats and the phosphorus and potassium plats failed to produce any heads, while the nitrogen and manure plats yielded satisfactory crops. A positive correlation was evident between the earliness of maturity and the firmness of heads, and plats receiving phosphorus in addition to nitrogen matured earlier than plats receiving nitrogen or nitrogen plus potassium alone.

Inbreeding studies with Cucumis melo, G. W. Scott (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 485*).—Among the conclusions drawn from this study at the University of California are that (1) loss of vigor, as measured by the number and weight of fruits, does not necessarily follow the selfing of Salmon Tint, Hale Best, Honey Dew, and Casaba melons for from four to seven generations, (2) inbred lines with fruits heavier than, equal to, or lighter in weight than the parents may be isolated from Salmon Tint and Hale Best, (3) lines differing from the parent in shape of fruit may be isolated, (4) heterosis is not evident in combining inbred lines of differing fruit weight, and (5) fruit shape is obviously governed by several factors.

Observations on flower bud and pod development in okra, R. A. McGinty and W. C. Barnes (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 509–513, figs. 2*).—A systematic study of the fruits of four okra varieties showed certain variations, notably an abnormal development characterized as intercarpellary fruits. The percentage of fruits thus affected varied with the varieties and possibly with climatic conditions, cool temperature seeming to encourage their development. Other abnormalities observed were seedless pods, the presence of two to four whorls of bracts instead of one at the base of the flower, and flowers consisting of pistils only.

Developmental morphology of Allium cepa, C. A. Hoffman (*Bot. Gaz., 95 (1933), No. 2, pp. 279–299, figs. 29*).—Results are given of a microscopic study at the Hull Botanical Laboratory of the structure of the embryo of the developing onion.

Effect of temperature upon the character of growth of mature onions, J. C. Miller (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 514–516*).—Of a lot of 40 Valencia onions stored at Stillwater, Okla., at about 65° F., one half placed in a warm greenhouse and shifted to the field in late April never developed any seed, while the others set out of doors in March seeded freely. Comparable results were procured at Baton Rouge, La., with Creole onions stored at 65° until planted in the field the middle of December, January, February, and March. In 2 of the 3 years all of the bulbs of the December and January plants produced seed stalks, while the majority of the March onions produced no stalks at all. Regardless of the date of planting all of the onions developed seed stalks between March 5 and April 10, indicating that the photoperiod was the controlling influence.

The effects of storage temperature and humidity on the keeping quality of onions, R. C. Wright, J. I. Lauritzen, and T. M. Whiteman (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 463–465*).—Yellow Globe onions, sorted carefully to remove all decayed and injured bulbs and stored at Arlington Experiment Farm, Va., at 32°, 40°, and 50° F. under low, medium, and high humidities, sprouted least at the lowest temperature. Relative humidity had little influence on sprouting, but root formation, on the other hand, increased consistently with the humidity with little relation to temperature. Under the conditions of the experiment there was little relation between decay and either temperature or humidity.

Effect of nitrogen, phosphorus, and potash on composition of Alaska peas, S. L. Jodidi and V. R. Boswell (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 454*).—As observed by the U.S. Department of Agriculture, none of the three nutrients, nitrogen, phosphorus, or potassium, had any consistently differential effect on time of maturity or on grade as related to size. Potash fertilizers had no effect on percentage content of starch or sugars, but did slightly increase the ash and the ether extract content and the proportion of protein to total nitrogen. Nitrogen fertilizers increased the percentage of sucrose slightly, lowered the starch content, and lowered the proportion of protein to total nitrogen. Phosphorus had no significant influence.

Factors affecting flowering and fruit setting in the pepper, H. L. Cochran (*Amer. Soc. Hort. Sci. Proc. 29 (1932), pp. 434–437*).—Seeking the reasons why in certain seasons peppers drop a large percentage of their flowers and fruits, plants were grown at Cornell University in the winter of 1931–32 under various conditions of temperature, day length, soil moisture, and soil nitrate. Daily records were taken on the number of blooms that opened and those that abscised. In both the medium (60° to 70° F.) and the warm house (70° to 80°) the fruit set was greater under normal day length than the long day where additional light was provided from 5 to 10 p.m. Pedicel diameter was also greater under the normal day in all treatments except the low nitrate, low moisture lot in the warm house. An elongation of the day retarded flowering 15 and 19 days, respectively, in the warm and medium houses. In the cool house (50° to 60°) peppers produced only one bloom which dropped.

The influence of soil type on results from paper-mulch trials with tomatoes, E. N. McCubbin and K. C. Westover (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 458–462*).—Studies conducted in 1930 and 1931 by the West Virginia Experiment Station on a fine sandy loam at Lakin and on a silty clay loam at Morgantown upon the comparative merits of ordinary shallow tillage and of medium weight mulch paper for unstaked Bonny Best tomatoes indicated that soil type is an important factor in determining results. In both years marketable No. 1 tomatoes were produced with paper at Morgantown, although the odds were significant in 1930 only. On the other hand, in both years tillage gave the largest yields of No. 1 fruit at Lakin, without statistical significance in either case. Soil moisture content was consistently higher both years in the mulched than in the tilled clay loam, with no consistent differences in the sandy soil. There were no definite indications in either soil that mulch paper influenced the pH or the amount of soluble nitrate in the soil.

Some results on the pruning, topping, and staking of the Marglobe tomato, J. B. Edmond (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 496–500*).—The pruning of Marglobe tomato plants, set in the field at the Mississippi Experiment Station on April 9 and trained to a single stem topped at the fourth cluster, resulted in significantly larger fruits in six of seven pickings from May 30 to June 29, inclusive. In four of the seven harvests the pruned plants were significantly more productive and slightly exceeded the unpruned in total yield for the entire period. Pruning not only increased the number of blossoms and fruits per cluster but also increased the percentage of set. In both lots the highest percentage of set was on the first cluster.

Growing tomatoes in Kansas, W. B. Balch (*Kansas Sta. Circ. 172 (1933), pp. 15, figs. 4*).—A presentation of general information on soils, fertilizers, culture, varieties, and pest control. Based on several years' trials, Bonny Best was the most productive tomato in the unpruned, unmulched group. As a whole the unpruned, mulched tomatoes were most productive.

The effect of potassium deficiency upon the structure and composition of the sweet potato, W. R. Robbins (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 471*).—In the absence of potassium Yellow Jersey sweetpotatoes growing in sand cultures otherwise supplied with complete nutrients behaved like other plants on a limited nitrogen supply, that is, the rate of nitrate assimilation decreased, the color of the leaves was light green, and the rate of top growth decreased. Analyses showed that the minus potassium plants were similar to low nitrogen plants. Apparently a deficiency of potassium in the nutrient supply decreased the ability of the plant to assimilate nitrogen needed for the formation of meristematic tissue required for the rapid increase in diameter of the sweetpotato root.

[Pomology at the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 215–220, 226–228, 232–236, 237, 238, 239–241*).—Among investigations by J. C. Blair, J. S. Whitmire, V. W. Kelley, W. A. Ruth, M. J. Dorsey, R. S. Marsh, R. L. McMunn, J. W. Lloyd, H. M. Newell, and A. S. Colby are those dealing with apple breeding, relation of the rest period to hardiness of fruits, training of apple trees, residual effects of nitrate of soda on apple trees, root injury to the apple from cultivation, the interrelation of pruning and nitrogen fertilization in the apple, the effect of pruning on the initiation of bearing in the apple, peach breeding, value of cowpeas as an orchard cover crop for peaches, fertilizing peaches, thinning of peach fruits, stimulation of sour cherry yields by pruning and fertilizing, adaptability of sweet cherries to Illinois, stocks for sweet and sour cherries, relation of packing costs to the quality of the fruit, new small fruits and nuts, irrigation of the strawberry, and improved varieties of gooseberries and raspberries.

The influence of drying on the after-ripening and germination of fruit tree seeds, I. C. Haut (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 371–374*).—No significant differences were observed at the University of Maryland in the germination of lots of apple, peach, and cherry seeds whether dried or held in a moist state prior to afterripening. Mazzard and mahaleb cherry seeds afterripened at 1° to 2° C. and permitted to dry at room temperature for periods of 2, 5, 10, 15, 25, and 35 days showed a marked loss in germinability, despite the fact that prior to testing they were soaked 48 hours to restore their moisture content. In the case of mazzard, 2 days of drying resulted in a loss of germination of approximately 78 percent. Restratification in moist sand at low temperature was ineffective in restoring germinability. Embryos in a completely afterripened condition were apparently much more sensitive to injury from desiccation than were seeds directly after harvest.

Cold resistance of grapes and fruits [trans. title], **A. F. Wilhelm** (*Gartenbauwissenschaft, 8 (1933), No. 1, pp. 77–114, figs. 7*).—Extensive experiments with grape rootstocks and cuttings and apple and pear rootstocks, held in constant temperature chambers at various levels below freezing temperatures, showed wide differences in resistance. On the average, roots of vinifera grapes were less cold-resistant than American types. Müller-Thurgau and Riesling were the tenderest of the viniferas, but in the canes Riesling proved the most resistant of the European types. Evidence was seen that potash increases the resistance of grapes to low temperature, whereas an excess of nitrogen or a lack of phosphorus tended toward susceptibility.

Among fruits, cherries, apricots, Brussels plums, quinces, and pears were more tender than apples. Among pears Williams Christ (Bartlett) was less hardy than Clapp Favorite.

Character of hemicellulose in certain fruit trees, W. E. Tottingham (*Plant Physiol., 8 (1933), No. 4, pp. 559–561*).—Comparisons at the University of Wisconsin of hemicellulose extractives of two seasons' growth of apple, pear, and cherry and one season's growth of peach and plum, all taken in August, showed very low contents of either galactose or galacturonic acid and very high proportions of xylose in the cherry and peach. Attention is called to the fact that the supposed conversion of glucose to xylose was more extensive in the cherry and peach, species well known for their capacity to form pentose gums. The data suggest that glucose and xylose are equally significant reserve components in the hemicellulose fraction.

Factors influencing the variability of apple trees in the nursery row.—I, Time of bud start, F. E. GARDNER and F. B. LINCOLN (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 367–370*).—In a cooperative study between the U.S. Department of Agriculture and the Maryland Experiment Station, McIntosh buds were worked on a clonal rootstock (Spy 227) and so placed that in half the trees the buds faced the east and in half the west. In early March certain buds were painted black or white in an attempt to influence spring starting. As compared with controls black had no apparent influence, but white did slightly retard the buds both on east and west exposures. In all cases buds on the east side of trees started earlier than the western buds, but, as measured by height of the resulting whips, the early start was not correlated with growth. Despite using a clonal rootstock, the time of starting of the buds varied much as in seedling stocks.

The coefficient of correlation between stock size and height of whip was 0.25±0.027. An inverse relationship was established between the diameter of the stock and the time of bud start, despite the fact that large trees were associated with large roots. The early starting of buds is deemed to be an accompanying rather than a causal factor influencing the height of the young tree.

A study of the factors influencing red color on apples, L. A. FLETCHER (*Maryland Sta. Bul. 353 (1933), pp. 79–119*).—Investigations conducted by the station and the U.S. Department of Agriculture indicated that two general factors, namely, light and nutrition, influence the development of color in the apple, and that the grower by pruning, fruit thinning, and soil management can influence coloring to a measurable extent.

Short rays of the visible spectrum and a portion of the ultraviolet rays present in sunshine were found most effective in inducing color. The enclosure of fruit in red cellophane bags inhibited red color development in normally red apples. It was evident that the very clear days of late autumn permit maximum transmission of the useful short rays.

Fertilizers such as potassium sulfate, potassium chloride, superphosphate, lime, and sulfur, and chemicals such as citric acid, magnesium sulfate, manganese sulfate, iron carbonate, and iron sulfate had no effect on red coloration of apples. The application of sugar to the surrounding soil increased red color in most cases and added to the carbohydrate content of the fruit. Fall or spring applications of nitrogen fertilizers reduced and midsummer or late summer applications of nitrogen fertilizer had little effect on color. Irrigation during a season of abundant rainfall decreased color in Rome Beauty and Oldenburg, while in seasons of moisture shortage irrigation increased the color of Rome Beauty, Wealthy, Jonathan, and York Imperial. The injection of sugar, hydrochloric acid, and boric acid into limbs caused slight defoliation and increased slightly the color of the apple, whereas the injection of nitrate of soda and malic acid decreased color.

The source of apple seedlings in relation to blotch infection, J. A. McCLINTOCK (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 359, 360*).—Observations at the Indiana Experiment Station showed a considerable development of blotch cankers on apple seedlings obtained from midwestern nurseries, despite the absence of visible infection at the time of planting. The cankers were located near leaf scars, indicating that they were derived from petiole infections late in the preceding year. Pointing out that French crab seedlings are free of blotch, apparently not from inherent resistance but from isolation, the author suggests the desirability of growing apple seedlings in areas where there are no centers of blotch inoculum.

Nutrient elements used by leaves and growth of apple trees, E. Burke and H. E. Morris (*Plant Physiol., 8 (1933), No. 4, pp. 537–544*).—Analyses at the Montana Experiment Station of the various portions of two adjacent 20-year-old apple trees, one dug April 9 and the other June 11, showed a gradual reduction in the percentages of N, P, Ca, Mg, and K in the dormant tree from the youngest to the oldest wood, with the roots relatively rich in these elements. The same general trend was manifest in the rapidly growing tree, but with the exception of K all of the elements were higher in the dormant tree. The leaves and new growth secured from the roots and soil 66.9, 97.9, 100, 83.2, and 61.1 percent, respectively, of their N, P, K, Ca, and Mg, suggesting that the rapidly growing apple tree draws on the soil and emphasizing the importance of having an ample supply of nutrients and moisture in the soil in early spring. Ca behaved similarly to N and Mg to K.

Examination of starch and hemicellulose extracts from apple wood, H. Otterson and W. E. Tottingham (*Plant Physiol., 8 (1933), No. 4, pp. 561–564*).—At the University of Wisconsin starch extracts of apple twigs 1 year old were found to contain an average of 15 percent ash, 10 percent crude protein, 23 percent uronic anhydride, 12 percent pentosan, and 39 percent of true starch. True starch was obtained by subtracting the pentose equivalent of true pentosan from the total reducing power of the extract. Data on the hemicellulose extract suggest that the hemicellulose fraction is less definitely and directly related to plant performance than is the starch.

Accumulation of carbohydrates in apple foliage, bark, and wood as influenced by moisture supply, J. R. Magness, L. O. Regeimbal, and E. S. Degman (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 246–252, figs. 2*).—That carbohydrate synthesis in apple foliage may be reduced under conditions of moisture shortage was indicated in studies conducted by the U.S. Department of Agriculture near Hancock, Md., in 1932, when beginning in early July the soil moisture of the nonirrigated plats declined to a point of decreased growth and functioning of the trees, as indicated by the shortening of the period of stomatal opening and a lessened accumulation of sugar and starch in the leaves as compared with irrigated trees. The bark and wood of the irrigated trees contained less total sugar but markedly more starch than that of corresponding dry trees, suggesting that drought apparently had a similar effect to low temperature in causing a greater proportion of carbohydrates to be in soluble form. With regard to moisture there was apparently a very close correlation between moisture supply in the leaves and in the bark, suggesting the possibility that water in the bark may be obtained through the leaves rather than from the wood direct.

The rate of photosynthesis of apple leaves under natural conditions, I, A. J. Heinicke and M. B. Hoffman (*[New York] Cornell Sta. Bul. 577 (1933), pp. 32, figs. 5*).—Using the previously described apparatus (E.S.R., 68, p. 744) designed for determining the carbon dioxide assimilation of leaves, data were taken on the leaves of 1-yr.-old McIntosh trees growing in the greenhouse. Marked fluctuations in the carbon dioxide content of the air were observed from day to day with changing temperature and atmospheric pressure. At least 2 to 2.5 l of air had to pass through the apparatus each hour for each square centimeter of exposed leaf area in order to equal the absorption of carbon dioxide from a free supply of apparently still air. The critical temperature for carbon dioxide assimilation for the apple is stated to be about 35° C. Light less than 1,200 foot candles in intensity inhibited maximum assimilation; therefore unfavorable weather conditions, such as continued cloudiness, reduced assimilation.

Computations of the average daily production of dry matter per unit leaf surface showed considerable variation between leaves on a single or on separate shoots. Dark green leaves manifested a high rate of photosynthetic activity, whereas succulent leaves subject to wilting on hot days showed marked reduction at such times. A failure of the roots to grow actively inhibited assimilation of carbon dioxide. Among other internal factors reducing carbon dioxide assimilation were a shortage of chlorophyll, a lack of certain nutrients, and the nontransfer of the products of photosynthesis.

The effect of submerging the roots of apple trees at different seasons of the year, A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 205–207*).—At Cornell University the submergence in autumn to a depth of 3 in. above the surface of the soil of McIntosh trees growing out of doors in 3-gal. galvanized buckets resulted in no injury, even when the period of flooding extended from October 20 to March 17, the date on which all of the trees were brought into the greenhouse. Trees submerged from June 1 to July 1, 1932, were uninjured, but shorter treatments which included even one excessively warm day caused serious injury. The primary cause of injury is believed to be a shortage of oxygen, resulting in blackened roots, spindly twigs, and small leaves with yellow-bronzed margins. Despite their submergence in water, the injured roots are unable, especially in hot weather, to supply the requisite moisture.

Apple fertilizer experiments [trans. title], E. Lierke (*Gartenbauwissenschaft, 7 (1933), No. 4, pp. 467–488, figs. 7*).—At Ittendorf, Germany, Ernst Bosch apple trees on Doucin roots averaged over a 16-yr. period 9.14, 18.87, 10.12, 11.52, and 15.73 kg of fruit per tree for unfertilized, complete fertilizer, minus potash, minus nitrogen, and minus phosphorus plats, indicating that all three principal elements were effective, particularly the nitrogen and the potash. In a trial at Cölsa complete fertilizer again gave the best results but with strong indications that on sandy soil, such as used, potash was even more important than were phosphorus or nitrogen. Potash apparently exerted a beneficial influence not only on yield but on the color and attractiveness of the fruit.

Re-working full-bearing apple trees, P. H. Thomas and T. D. Raphael (*Tasmanian Jour. Agr., 4 (1933), No. 4, pp. 147–156, figs. 12*).—Results of various experiments in grafting mature apple trees are discussed, with numerous illustrations.

The removal of lead and arsenic spray residues from apples and pears, R. H. Robinson and M. B. Hatch (*Oregon Sta. Bul. 317 (1933), pp. 15*).—Discussing briefly the necessity of removing both lead and arsenic from fruits, the authors report that all lots of fruits, including very waxy, heavily sprayed samples were cleansed well below the lead and arsenic tolerances by a double washing treatment consisting of (1) sodium silicate solution, and (2) hydrochloric acid solution. For fruit difficult to clean, underneath revolving brushes were found superior to the overhead flood-type washer. Degumming or wetting agents used in combination with hydrochloric acid materially aided in cleansing fruit, but on account of excessive foaming degumming agents are said to be unsuited for commercial washers until a satisfactory antifoaming material is found.

Temperature of the washing fluid was a most important factor in the cleansing of difficult fruit such, for example, as that sprayed with oils late in the growing period. Hydrochloric acid was most effective at relatively low concentrations and at a temperature of 100° to 110° F. Waxy fruit chilled after picking or in storage was more easily cleansed if first warmed in a water bath maintained at 110°. Both sodium chloride and sodium nitrate were found helpful when used as a supplement to hydrochloric acid heated to 90° or above. Sawdust used with either hydrochloric acid or sodium silicate solutions added somewhat to the cleansing power.

Biochemical investigations of certain winter pears, J. C. Moore (*Oregon Sta. Bul. 316 (1933), pp. 10*).—Analyses of representative samples of Anjou, Beurre Bosc, Comice, and Winter Nelis pears brought to optimum eating quality in a warm room following storage at 30° F. showed no material differences between the varieties with regard to most of the constituents. Total sugars for the four varieties were 10.56, 10.3, 9.8, and 10.7 percent, respectively. Crude fiber was also abundant, but fats, proteins, and wastes were relatively low.

The buffer values of fresh pear tissue ranged from 0.2398 for Anjou to 0.397 for Beurre Bosc, low as compared with other foods. The alkalinity of the ash ranged from 3.6 in Comice to 5.76 in Winter Nelis. Phosphorus and sulfur contents were much lower than those heretofore reported for pears. The iron-copper ratio was unusual, especially in comparison with other foodstuffs.

Apricot pruning experiment at Light's Pass, J. B. Harris (*Jour. Dept. Agr. So. Aust., 37 (1933), No. 4, pp. 394–398, figs. 5*).—Moorpark apricot trees pruned to the so-called long system yielded approximately three times as much fruit in their first crop year as did short-pruned trees. The average girths of the long-pruned and the short-pruned trees were 15.3 and 14.1 in., respectively.

Some experiments in budding fruit tree stocks, W. H. Upshall (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 361–364, fig. 1*).—In experiments at the Horticultural Experiment Station at Vineland, Ont., in which Windsor cherries were budded on mazzard and mahaleb roots at approximately 10-day intervals from early July to mid-September, it was observed that the optimum time for budding mazzard was mid-August whereas mahaleb was budded successfully any time in August and early September. Attempts to control leaf spot and mildew, serious handicaps in mazzard propagation, were unsuccessful. Rubber strips, found slightly more effective than raffia for tying buds, are recommended because of easier application.

In comparing various treatments, such as wet paper, wet moss, moist moss, oiled paper, and wax, as protection for bud sticks of various fruits, waxing gave the most promising results, especially with the peach. There was some indication that in the wet packings the excess water injured the buds. In one test in which the leaves were left intact, excellent results were secured except with the peach.

A system of pruning peach trees designed to regulate the height and renew the tops, J. S. Shoemaker (*Ohio Sta. Bimo. Bul. 165 (1933), pp. 144–146, fig. 1*).—Discussing briefly the principles of peach pruning, the author describes a system for trees of fruiting age which consists primarily in the removal of the largest branch at each crotch. Such treatment tends to restrict height development and promote vigorous but not excessive growth.

Peaches and their pollination [trans. title], **P. Branscheidt** (*Gartenbauwissenschaft, 8 (1933), No. 1, pp. 45–76, figs. 12*).—The author classifies varieties on the basis of the form and size of flowers as large and small rose-shaped and large and small bell-shaped blooms. In addition, data are presented on the time of flowering, the abundance of flowers, and the time of exfoliation. The germination of pollen in sugar solutions revealed only two varieties, June Elberta 2 percent and J. H. Hale 0 percent, with useless pollen. Both of these varieties had 8 haploid chromosomes, the normal number in the peach.

Maximum pollen germination (97 percent) occurred in Early Elberta. In self-pollination experiments J. H. Hale and June Elberta proved self-unfruitful. In crossing experiments no mature fruits were obtained from the following combinations: Amsden × Mayflower, Arkansas × Robert Blum, Cumberland × Roter Ellerstadter, Hiatt × Mayflower, Mayflower × Cumberland and Sieger × Amsden. Whether the lack of fruit might have occurred through an accident during the ripening period was not certain. Some evidence was obtained that wind is a factor in the pollination of adjacent peach trees.

Pollination experiment with plums, I [trans. title], C. F. Rudloff and H. Schanderl (*Gartenbauwissenschaft, 7 (1933), No. 4, pp. 421–457*).—Of 33 varieties of plums studied at Geisenheim, 10 were found self-unfruitful, 11 partially self-fruitful, and 10 fully self-fruitful. Two varieties, Grosse Grüne Reineclaude and Mirabelle von Metz, were fruitful one year and unfruitful the next, but whether this change was due to environment or to genetic causes, such as somatic mutation, was questioned. Among reciprocally unfruitful combinations were Grossherzog von Luxemburg × Königsberger Frühzwetsche and Ebersweier Frühzwetsche × Frankfurter Pfirsichzwetsche. Most of the varieties investigated yielded sufficient viable pollen for ordinary purposes.

The effect of removal of fruiting canes after harvest upon the growth of new canes in the Latham raspberry, W. G. Brierley (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 300, 301, fig. 1*).—The removal at the University of Minnesota of the fruiting canes of Latham raspberry plants immediately at the close of the harvest season resulted in a week more of growth in autumn and in somewhat longer canes than on those plants where the fruiting canes were allowed to remain. The author suggests that the later growth may be undesirable in Minnesota in certain years where early freezes sometimes severely injure immature canes.

Nitrogen fertilization of Latham red raspberries, W. H. Childs and M. B. Hoffman (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 302–305, fig. 1*).—At the West Virginia Experiment Station 300 lb. of sodium nitrate applied to Latham raspberries without other fertilizers either in April or September gave significant increases in yield over the unfertilized checks. On the other hand, 200 lb. per acre failed to give significant gains. No consistent advantage was evident for either spring or autumn applications. The coefficient of correlation between the number of canes and yield was 0.594±0.072, between cane length and yield, 0.471±0.087, and between cane diameter and yield, 0.386±0.095.

Seasonal tests of the fruits of various raspberry varieties, L. R. Tucker (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 306–312, fig. 1*).—Studies at the Idaho Experiment Station on four red raspberries, Cuthbert, Latham, Ranere, and King, and three black varieties, Cumberland, Gregg, and Kansas, showed considerable differences in size of fruits in the red varieties, with the three blacks of about equal size. Latham had the largest fruits of all, averaging 2.1 g. There were fewer drupelets in the red than in the black varieties. In firmness little difference was found among the four reds or among the black varieties. As a group, early in the season the blacks were firmer than the reds, but at the end of the season there was little difference.

As recorded by the refractometer, the percentage of soluble solids in the red varieties remained rather constant throughout the season. The blacks not only contained a higher percentage of solids at the beginning of the season but the difference increased markedly as time progressed. In the blacks there was a negative relation between firmness of fruit in a given variety and the percentage of soluble solids in its juices.

Time of bud differentiation in the Dunlap strawberry, J. C. Schilletter (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 325–329*).—Observations over several years at the Iowa Experiment Station showed an association between environmental factors, such as low temperature and insufficient soil moisture, and the initiation of fruit bud differentiation in the strawberry. Apparently a decrease in moisture or a lowering of temperature resulted in decreased vegetativeness and an accumulation of carbohydrates.

Influence of nitrogenous fertilizers applied at different rates on the numbers of flower clusters, flowers, and fruits of the strawberry, R. W. Taylor (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 313–317*).—During the unusually mild winter of 1931–32, when growth and flowering of strawberries occurred almost continuously in Alabama, it was observed that applications of nitrogenous fertilizer, cottonseed meal, and urea in the fall and early winter increased the number of flower clusters, flowers, and fruits. Nitrogen applied in January or February to well-grown plants usually increased the number of open flowers, but when applied to nitrogen-deficient plants late in the growing season immediately preceding ripening nitrogen tended to suppress flower and fruit production. As a practical suggestion it is stated that nitrogen should be applied in autumn and again 90 days prior to the expected date of the first picking.

Effect of fertilizers on plant growth, yield, and decay of strawberries in North Carolina, G. M. Darrow and G. F. Waldo (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 318–324*).—Experiments carried on by the U.S. Department of Agriculture at Willard, N.C., with Missionary and Blakemore strawberries showed favorable influences on yield from the three elements, nitrogen, phosphorus, and potassium, except in certain plats where excessive fertilization actually harmed the plants. Usually when phosphorus or potassium, or both, were applied with nitrogen the yields were below those of nitrogen alone. In the no-fertilizer, the potash, and the phosphorus plats the berries were relatively late in maturing, indicating that nitrogen is essential to the production of large yields of early berries in the area in question.

The effects on leaf development were considered remarkable; for example, in 1928 the inorganic nitrogen plants produced over twice as many leaves as did the no-nitrogen plants. However, injuries to the fruit from rot and to the plant from drought were greatest in the highly vegetative plats, suggesting the desirability of using a well-balanced fertilizer containing nitrogen, phosphorus, and potassium. Sufficient nitrogen should be used to promote vigorous growth and production without excessive foliage.

A contribution to ampelography, III [trans. title], H. Moog (*Gartenbauwissenschaft, 8 (1933), No. 1, pp. 1–44, figs. 42*).—Following a brief discussion of parentage and origin, technical descriptions are given of 34 hybrid grapes either American or of American and vinifera parentage.

Effect of the relative vigor of the vine at planting on the fruiting and growth of the Concord grape, A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 290*).—The average of 9 years' yield records taken by the Maryland Experiment Station on vines graded at the time of planting into strong, medium, and weak groups showed the strong and medium, 24 and 15 in. of top growth at planting, respectively, to have been 28 and 22 percent more productive than the weak vines, 8 in. of top growth. Five-year records of pruning gave averages of 60.7, 52.3, and 44.9 oz. per vine in the respective groups. The strong vines maintained more regular annual production, and there was no tendency for the differences between the groups to diminish as the years progressed.

Effect of defoliation on the fruiting of Concord grape shoots, A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 317*).—Leaf removal just prior to the opening of the blossoms resulted at the Maryland Experiment

Station in a 17 percent decrease in berry set, smaller berries, and a 27 percent decrease in the length of the treated shoots, despite the fact that new leaves were put forth rapidly. The controls were adjacent to comparable shoots on the same vines. The importance of early foliage was shown in an improved size of cluster following cluster thinning prior to the setting of the fruits.

The lateral movement of elaborated foods in the grape vine, A. J. Winkler (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 335–338*).—That nutrients synthesized by the foliage of shoots without fruits may be translocated in considerable quantity to fruit-bearing shoots on the same vine was indicated in experiments with Muscat, Malaga, Tokay, and Sultanina grapes at the California Experiment Station. The fruit of defoliated shoots was found as well supplied with nutrients, as indicated by degree Balling, acidity, and average weight of berries, as were the controls. No material difference was noted with relation to the position of the defoliated shoots on the vine and its nutrition. In the Muscat and Malaga varieties the total distance to which foods moved were 1.5 and 3 ft., respectively. The author concludes that synthesized foods apparently move readily among the different parts of the vine, and, within limits, are equally available to all clusters. Ringing resulted in every case in a higher percentage of total solids above the wound.

Comparison of systems of pruning grapes, F. W. Faurot (*Missouri Fruit Sta. Bul. 26 (1933), pp. 27, figs. 6*).—In presenting further information on the results of a grape training experiment (E.S.R., 61, p. 141) begun in the spring of 1919, the author states that the 4-arm Kniffin system continued to maintain its superiority over the Y-Kniffin, Munson, recurve fan, high renewal, and spur in the order given. Canes on the top wire of the trellis were slightly more productive per node than those on the lower wire. Late February or early March proved a desirable season for pruning, as measured by yield.

In the Concord grape the optimum number of buds left per vine after pruning was somewhere between 40 and 60, and the optimum buds per cane approximately 15. Vines reduced in vigor by continued heavy fruiting tended to recover during light crop and off years. The weight of prunings proved a satisfactory index to vigor and productive capacity of the vine. In the individual cane diameter was a better index to productivity than was length.

Inheritance in Vitis vinifera [trans. title], A. Pirovano (*Ann. Tec. Agr., 6 (1933), Nos. 4, I, pp. 414–436; 5–6, I, pp. 521–555*).—This is a discussion of Mendelian inheritance in the grape, with special reference to results secured at the Institute of Fruit Culture and Electrogenetics at Roma. Among characters observed were shoot color, shoot pubescence, berry color, cluster size, and aroma. Exposure of grape pollen to electromagnetic discharges was found to bring about early maturity in the resulting seedlings, two of which are distinguished by the appropriate names Galvani and Volta.

Effects of fumigation of different varieties of vinifera grapes with sulphur dioxide gas, W. T. Pentzer, C. E. Asbury, and K. C. Hamner (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 339–344, figs. 2*).—Determinations by the U.S. Department of Agriculture of the amount of SO_2 absorbed by grapes during the process of fumigation with 1.5 and 2 percent SO_2 gas showed that varieties differed in their rate of absorption of the gas. In general Gros Guillaume, Alicante Bouschet, and Emperor absorbed less SO_2 during an hour's exposure than did Sultanina, Malaga, and Castiza. With shorter periods the differences were less marked. In a given variety the absorption rate varied from year to year, and considerable variation was noted in the amounts of SO_2 injuries, not only to different varieties but also to different lots of the same variety. The nature of SO_2 injury on grapes is discussed.

Studies on the removal of arsenical spray residue from grapes, J. M. Lutz and G. A. Runner (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 345–349*).—Grapes of the eastern type, such as Concord, Delaware, and Niagara, sprayed with arsenicals to control berry moth were cleansed below the legal tolerance by submergence in a hydrochloric acid solution for 5 minutes, followed by rinsing in clear water. Spraying grapes before harvesting with dilute hydrochloric acid was not successful in residue removal. The type of spreader used with the sprays had little or no influence on residue removal. Acid concentrations greater than 1 to 1.3 percent actual acid were no more effective and caused fruit injury. Even with careful handling there was slightly more mold developing on washed than unwashed grapes, but low temperatures (32° to 40° F.) tended to check mold. Washed Concord grapes packed wet in 12-qt. climax baskets were shipped successfully from Michigan to Washington, D.C.

Coulure of the grape crop, F. de Castella (*Jour. Dept. Agr. Victoria, 31 (1933), No. 10, pp. 524–527, fig. 1*).—A general discussion is presented of the nature, possible causes, affected varieties, and methods of reducing loss from premature abscission of berries. Among the effective measures suggested are girdling, cluster thinning, and the use of well balanced fertilizers.

Citricultural research, E. S. West (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 4, pp. 225–232, fig. 1*).—In discussing the investigational program of the Commonwealth Research Station, Griffith, New South Wales, the author reports that orange trees cover cropped in winter with tick beans made greater growth than those handled in the following ways: (1) Summer crop of cowpeas, (2) biennial crop of Bokhara clover, (3) perennial lucerne crop, and (4) continuous clean culture. The trees interplanted with cowpeas made less growth than those in the clean tilled areas, apparently as a result of competition for water and possibly minerals. On the other hand no significant differences in yield or growth were observed in commercial fertilizer plats. However, phosphorus did influence materially the growth of lucerne. During 1932 it was found that the fruit of trees on the winter cover crop area and clean tilled area colored earlier and contained less acid.

Citrus studies, T. Tanaka (*Kankitsu no Kenkyû. Tokyo: Yôkendô Shoten, 1933, pp. VIII+443, pls. 4, figs. 227*).—A Japanese text on citrus culture in which the author discusses botanical relationships, varieties, general culture, pruning, propagation, and crop protection, with a review of experimental evidence secured in the United States and other citrus-growing regions.—(*Courtesy Biol. Abs.*)

Variability in citrus propagated by cuttings and by budding, F. F. Halma (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 365, 366*).—Studies of the behavior of young trees developed from buds and cuttings obtained by the California Experiment Station, Riverside, from 13 selected Valencia and 10 Washington Navel orange trees failed to show any greater uniformity in the cutting than in the bud groups. In three lots of Valencia the cuttings in two cases had a greater coefficient of variability than the budded trees. In the navel oranges there was practically no difference in variability.

The origin of the Marsh Seedless grapefruit, T. R. Robinson (*Jour. Heredity, 24 (1933), No. 11, pp. 437–439*).—A brief account is given of the early history of the Marsh Seedless and certain other seedless grapefruits.

Palestine orange shipments (*[Gt. Brit.] Empire Marketing Bd. [Pub.] 68 (1933), pp. 50, pls. 4*).—Asserting that practically the entire export of Palestine oranges is of the Jaffa variety, a discussion is given of the shipping conditions and the results of certain experiments for reducing wastage, which averaged 5 percent over the entire season. About 90 percent of the storage loss was due to *Penicillium digitatum* and *P. italicum*.

Wilting oranges at comparatively high temperatures for from 7 to 10 days reduced losses from *Penicillium*, but treatment with ethylene increased their susceptibility to *Diplodia* rots. Fruit from trees on sour orange roots and heavy soil was unusually resistant to disease. The sugar-acid ratio, although somewhat low in early-picked fruits was nevertheless sufficient.

A study of coconut seedlings in relation to shape of the nuts, F. S. MACEDA (*Philippine Agr., 22 (1933), No. 6, pp. 430–441, figs. 2*).—At the Philippine College of Agriculture round coconuts were found to germinate more quickly than oblong nuts, and the resulting seedlings were heavier and produced more leaves and roots. The length of leaves and of roots was apparently unaffected by the shape of the parent nut.

Chemical composition of passion fruit, W. R. JEWELL (*Jour. Dept. Agr. Victoria, 31 (1933), No. 12, p. 609*).—Data are presented on the results of analyses of the pulp and shell of the passion fruit (*Passiflora edulis*).

Results of studies on the artificial coloring of pecan nuts by bleaching and dyeing processes, A. O. ALBEN and J. J. SKINNER (*U.S. Dept. Agr., Bur. Chem. and Soils, 1933, pp. 22*).—Of various chemicals tested at the U.S. Department of Agriculture pecan laboratory, Shreveport, La., for bleaching pecans, a solution of sodium hypochlorite containing about 5 percent free chlorine was found most effective. The most attractive nuts were secured with an immersion of from 4 to 8 min. in a solution of the hypochlorite held at 20° to 30° C. Washing for 1 min. in diluted sulfuric acid following bleaching was found essential. Cleaned nuts bleached smoother and more uniformly than did uncleaned. A blend made up of three parts Rana, two parts Naphthol Yellow S, and two parts Sunset Yellow F.C.F. proved an attractive dye, especially when the outer surfaces were cleaned free of acids and dried.

Some recent investigations into methods of storing walnuts during the winter, J. B. HAMOND (*Gard. Chron., 3. ser., 94 (1933), No. 2438, pp. 219, 220, figs. 4*).—At the East Malling Research Station, England, Persian walnuts were satisfactorily bleached by dipping for 3 min. in the supernatant liquid poured off from a mixture of solutions of chloride of lime and of washing soda. Such treatment not only improved the appearence of the nuts but also increased their resistance to mold. Dusting nuts with sulfur before storing proved a satisfactory protection from molds, but difficulty was met in removing the sulfur from the nuts before marketing. Covering nuts with paraffin kept them well but resulted in a disagreeable flavor, due apparently to impeded respiration.

A temperature of 38° F. and a relative humidity of about 90 percent were found essential to the keeping of nuts without other protection. A mixture of salt and coconut fiber in equal parts by weight proved an excellent storage medium for nuts. The importance of thorough cleansing of the surface before storage was indicated.

[Floriculture at the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 255–258*).—Statements of general progress are presented by F. F. Weinard and H. B. Dorner on variety tests of gladiolus, soil management of carnation houses, peony varieties, effect of heavy cutting on the flowering of peonies, and the control of flower splitting in the carnation.

Bank sand as a medium in which to grow chrysanthemums, A. M. S. PRIDHAM (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 534–536*).—At Cornell University chrysanthemums growing in bank sand alone and in sand plus German peat made satisfactory growth when supplied at weekly intervals with nutrient salts. However, when nitrogen was withheld from the plants from August 17 to September 1 the foliage became light green with occasional red veining.

Determinations on a dry weight basis of the total nitrogen in the leaves showed 2.19 percent in the composite sample of continually fertilized plants and 1.28 percent in the sample from plants deprived of nitrogen in late August. A significant but negative correlation, —0.692 ±0.0809, was established between the date of bloom and the total amount of nitrogen supplied.

Further studies of photoperiodism of the chrysanthemum, G. H. POESCH (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 540–543*).—Continuing his studies (E.S.R., 68, p. 197) on the response of chrysanthemums to an abbreviation of the normal light period, the author presents data on the number of days required and the most successful period for treating various varieties. An insufficient duration of the shading treatment resulted in irregular blossoming and in some cases in a large number of cull flowers.

Further results with black cloth for the production of early blooms of the chrysanthemum, K. POST (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 545–548*).—Adding to previous information (E.S.R., 68, p. 196), the author states that no difference was found in the effectiveness of four black sateens, but that black sateen was much more effective than black costume cloth. Concerning the number of days required for shading to become effective, in the majority of cases the time of bloom of plants darkened for 15 nights or less was no earlier than the controls. The time of bloom was not affected by the date of propagation of the cuttings nor by the date of the final pinching of the plant.

Germination and storage of delphinium seed, L. V. BARTON (*Bul. Amer. Delphinium Soc., 2 (1933), No. 1, pp. 12–14; also Boyce Thompson Inst. Plant Res., Prof. Paper, 1 (1933), No. 26, pp. 248–250*).—Studies at the Boyce Thompson Institute with annual and perennial forms of delphinium showed favorable germination temperature ranges of 59° to 68° F. and 59° to 86° for the two groups, respectively. This difference is believed to explain the greater success in midsummer germination of the perennial than of the annual form. Fresh, air-dry delphinium seeds stored at 46° in air-sealed containers retained their capacity for satisfactory germination over several years.

Growth of gladiolus as affected by storage conditions, A. M. S. PRIDHAM and J. C. RATSEK (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 526–529*).—Lucette corms dug late in the fall and stored at temperatures of approximately 32°, 40°, 50°, 60°, and 70° F. with respective relative humidities of 70, 80, 50, 60, and 30 percent were removed from storage on April 15, planted in pots in the greenhouse, and placed out of doors about May 15. According to the authors, storage temperatures, except in the case of the largest and smallest corms, had a significant effect on the number of days from planting to flowering; furthermore, the number of flower spikes and the number of corms produced by the mother corm were related definitely to the storage temperature. The humidity of the storage chamber was said to be apparently related only to the loss in weight of corms and not to the production of flowers or of young corms. Among other varieties tested some responded similarly to Lucette and others differently.

Flower development in narcissus during summer storage, D. V. LUMSDEN (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 522–525, figs. 4*).—Sampled at regular intervals from July 22 to October 6, significant progressive changes in flower development were recorded in King Alfred narcissus bulbs dug on June 20 and stored at Arlington Experiment Farm, Va., at temperatures approximately those out of doors. A total of two years was required for each single mature unit of a bulb from the time its first scales were differentiated until flowering.

Preliminary experiments on nutrients and the pH of water and nutrients as they affect growth of orchid seedlings, J. C. RATSEK (*Amer. Soc.

Hort. Sci. Proc., 29 (1932), pp. 558–561).—Hoping to discover why orchid seedlings grew better on an osmundine media containing one fourth German peat than on osmundine alone or on osmundine plus live sphagnum moss, seedlings were watered at Cornell University with buffered rain water of pH 3, 4, 5, 6, 7, and 8. Generally the poorest growth occurred at pH 7 to 7.5. Water acidified with nitric acid to a pH of 5 was more effective in stimulating growth than was tap water. Ammonium sulfate, although effective, was not equal to a complete nutrient solution. Nitrogen stimulated top growth more than root growth.

Sources of carbohydrate for germination and growth of orchid seedlings, F. L. Wynd (*Ann. Missouri Bot. Gard., 20 (1933), No. 4, pp. 569–581).*—Observations at Washington University on the growth of orchid seedlings in three different complete mineral solutions to which various forms of sugar were added in amounts to give 7 g of carbon per liter showed the following order of excellence of growth: d-mannose>d-glucose>maltose>d-fructose>sucrose>raffinose. No growth was secured on d-galactose and the pentoses, l-arabinose, l-rhamnose, and l-xylose. The inability of the pentoses to support growth is believed associated with their levorotating property.

Flower production of roses on limed and acidified soils, F. F. Weinard and S. W. Decker (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 521).*—No significant differences in growth and flower production were observed at the University of Illinois in the first season between roses grown on soils approximating pH 5 and 7.5 in reaction. In the second year many of the shoots on the limed plats, especially in the Rose Hill variety, were yellowed between the veins. This chlorosis is believed indicative of a lack of soluble iron in the soil and plant.

The response of some ornamental plants to soil reaction, L. C. Chadwick and J. H. Gourley (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 530–533).*—Of five species, namely, *Iris germanica, Lupinus polyphyllus, L. hartwegi, Daphne cneorum,* and *Delphinium ajacis,* studied in the greenhouse at the Ohio Experiment Station with respect to the most favorable soil reaction for growth, all benefited from a neutral or lightly alkaline reaction. Modifications in acidity were induced by the use of hydrated lime or aluminum sulfate, the plats being adjusted at unit intervals from pH 4 to 8. About 4 months were required for the iris variety Alcazar to show an appreciable response to the different pH reactions.

Further studies of the growth of ornamental plants in quartz sand, A. Laurie (*Amer. Soc. Hort. Sci. Proc., 29 (1932) pp. 537–539).*—Further evidence (E.S.R., 68, p. 192) was obtained at the Ohio State University that good quality flowers may be produced in pure sand to which complete nutrients are supplied regularly. Low ratio nutrients, 1–4–1 (NPK), supplied at 2- to 4-week intervals, depending on the season, at the rate of 2 lb. per 100 sq.ft. were sufficient to produce plants comparable to those grown in soil. Although pot plants could be grown in sand the increased weight was objectionable, and successful repotting was more difficult.

FORESTRY

[Research in forestry] (*U.S. Dept. Agr., Forest Serv. Rpt., 1933, pp. 35–45).*—Herein are included brief summaries of the results of studies in forest economics; fire control; growth and forest practices; erosion and stream flow control; logging practice; utilization of lumber for construction, fabrication, and paper manufacture; chemical and physical properties of wood; range operations; and miscellaneous related studies.

Research needs for the future in silviculture in the Inland Empire, F. G. Miller (*Northwest Sci., 7 (1933), No. 4, pp. 82–85*).—Certain needed lines of investigation, such as farm planting and nursery practices, the handling of native woodlands, trials of new species, natural reproduction on logged areas, and the relation of soil to tree growth, are discussed.

Root development in seedlings in relation to soil texture, C. H. Anderson and E. G. Cheyney (*Jour. Forestry, 32 (1934), No. 1, pp. 32–34, fig. 1*).—Norway pine, white spruce, and southern balsam seedlings grown at the University of Minnesota in boxes of sand differing in texture as a result of sifting through a series of screens ranging from 20 to 100, showed a well defined response to soil texture. The coarser the soil the longer were the taproots. Lateral roots, on the other hand, showed a slight tendency in certain cases to be shorter in the coarse soils. There were more rootlets in the coarser types.

Microchemical studies of tyloses, I. H. Isenberg (*Jour. Forestry, 31 (1933), No. 8, pp. 961–967, figs. 4*).—Studies at the New York State College of Forestry at Syracuse of the tyloses in sections of heartwood of various hardwood species, such as white oak, butternut, chestnut, and ash, suggested that these may be divided on a chemical basis into three types, (1) those of very thin walls composed chiefly of lignin, (2) those with a thin secondary cellulosic layer lining the outer layer of lignin, and (3) those with a thicker secondary layer of cellulose to which is added a tertiary layer of lignin.

Cupressus lusitanica as a suitable tree for east Texas, C. B. Webster (*Jour. Forestry, 31 (1933), No. 8, pp. 980, 981*).—Tests at Beeville, Angleton, Beaumont, Weslaco, Winterhaven, College Station, and other points in Texas indicated that this species is not suitable as a forest or ornamental tree for the commercial timber region of east Texas. The trees were unable to withstand a minimum of 11° F., not uncommon in the piney woods region.

Regeneration and management of sal (Shorea robusta) Gaertn. f., H. G. Champion (*Indian Forest Rec., 19 (1933), No. 3, pp. [2]+II+159, pls. 24*).—Herein is presented a survey of existing problems, with proposals for necessary further investigations.

Diameter growth of ponderosa pine as related to age and crown development, H. Krauch (*Jour. Forestry, 32 (1934), No. 1, pp. 68–71, figs. 2*).—Utilizing measurements taken at 5-yr. intervals over a period of 20 yr. on permanent sample plats located in cut-over stands in the Coconino and Tusayan National Forests, Ariz., the author found a higher rate of diameter growth in those trees having the best crown development. Immature trees under 150 yr. of age, designated as black jack, had a more rapid growth rate than older trees of the same diameter.

Does it pay to reserve thrifty mature trees of ponderosa pine for future cutting? H. Krauch (*Jour. Forestry, 32 (1934), No. 1, pp. 72–75, fig. 1*).—On the basis of data taken on a cut-over plat located on a high quality site in the Coconino National Forest, Ariz., the author proposes that in national forests where large bodies of virgin timber will remain uncut for 50 yr. or more increment per acre rather than increment percentage should be the major consideration in managing cut-over lands.

Girdling of ponderosa pine by squirrels, G. W. Pike (*Jour. Forestry, 32 (1934), No. 1, pp. 98, 99*).—From the middle of December to the end of February, when other food is scarce in the northern Black Hills, red squirrels were observed to peel the bark from young pines and to eat the succulent inner bark and cambium. Generally the attack was limited to trees of 4 to 7 in. diameter, but sometimes larger trees were injured.

Logarithmic expression of timber-tree volume, F. X. Schumacher and F. dos Santos Hall (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 9, pp. 719–734, figs. 8*).—Utilizing tree-volume data secured from the Pennsylvania State College, the Maryland department of forestry, and other sources, the authors deduce timber-tree volume equations of the power or logarithmic type in terms of diameter and height on the theory that the volume of the tree stem, unlike that of the geometrical solid, may vary not directly as height and as the square of the diameter but as other powers of these dimensions in both cubic feet and board feet. The theory is tested by transforming the power equation into a linear one and calculating the logarithmic regression equations for available data. Comparison of the actual tree volumes with those estimated from the equations is said to confirm the hypothesis beyond practical doubt. The usefulness of the standard error of the regression equations in testing the significance of the difference between two sets of data and the expression of the equations in volume alinement chart form are illustrated.

Volume tables to fixed top diameters, R. R. Reynolds (*Jour. Forestry, 32* (*1934*), *No. 1, pp. 29–31*).—On the basis of tables computed from stem analyses of 1,109 loblolly and shortleaf pines in southern Arkansas. the author asserts that many volume tables now in use for these species fail to give a true estimation of volume of merchantable wood because they have fixed a top diameter limit. Board foot and cubic foot material at the top of the trees, as well as in small trees, may often be very unprofitable to log and mill.

A modified plot method of timber cruising applicable in southern New England, A. Goodspeed (*Jour. Forestry, 32* (*1934*), *No. 1, pp. 43–46*).—A description is given of a cruising method employing ⅛-acre circular plats spaced at intervals of 165 ft. which has proved successful in the Eli Whitney Forest at New Haven, Conn., for timber estimating. As compared with the usual strip method of cruising the new method saves time and money without unduly sacrificing accuracy of results.

Influence of glaze storms upon hardwood forests in the southern Appalachians, C. A. Abell (*Jour. Forestry, 32* (*1934*), *No. 1, pp. 35–37, fig. 1*).—Although only an occasional phenomenon, ice storms are believed to exert a relatively consistent influence on the form of forest trees in the southern Appalachians. A storm occurring in December 1932 in western North Carolina caused severe damage to scarlet oak and black locust, whereas white pine and hemlock appeared highly resistant. Pole stands suffered more than those with irregular canopies. Wounds resulting from the breakage are believed to form a ready entrance for insects and plant diseases.

Weather and forest fire hazard, with special reference to the upper altitudinal spruce-balsam fir region of northern New York, P. W. Stickel (*Jour. Forestry, 32* (*1934*), *No. 1, pp. 76–79, fig. 1*).—Observations taken by the U.S.D.A. Northeastern Forest Experiment Station in pure, even-aged coniferous pole wood stands surrounding Elk Lake (elevation 2,100 ft.) indicated that a practical approximation of duff moisture content and duff inflammability may be secured from a combination of data on relative humidity, air temperature, and the number of hours since the last measurable precipitation. Alinement charts based on the three elements and showing the degree of hazard are included. Fire hazards were closely related to the density of the stand, being very much less within the forest than in the open. Within the forest the surface duff moisture content fell below 50 percent less than 50 times during the 5 years 1926–30.

Deadwood lying on duff drier than in air, H. T. Gisborne (*Jour. Forestry, 31* (*1933*), *No. 8, pp. 979, 980*).—Data recorded at the Priest River Branch of the Northern Rocky Mountain Forest and Range Experiment Station showed 4.19, 3.84, and 6.21 percent of moisture on an oven-dry basis in sticks located, respectively, (1) just under the duff surface, (2) on top of the duff, and (3) supported 10 in. above the duff. Apparently, under the conditions obtaining, the lopping of branches may actually promote a slower rate of decomposition than if they were left attached to the tree.

DISEASES OF PLANTS

[Plant disease studies in Colorado] (*Colorado Sta. Rpt. 1933, p. 9*).—Results are noted from studies of the psyllid yellows of potatoes, collar rot of tomatoes, and control of carnation wilt.

[Plant disease studies in Illinois] (*Illinois Sta. Rpt. 1933, pp. 44–47, 57, 58, 222–226, 228–232, 238, 239, figs. 6*).—Results are briefly noted from studies on reduction of ear rots in corn, by B. Koehler; storage of seed corn, by Koehler and J. R. Holbert; control of oats smut by ethyl-mercury-phosphate and other fungicides, by Koehler; sprays for apple scab, by H. W. Anderson; lessening oil-spray injury, by V. W. Kelley and M. D. Farrar; soil treatment for control of apple measles, control of pear blight, and control of arsenical injury to peach foliage and bacterial spot, all by Anderson; winter injury to peach and apple trees, by M. J. Dorsey and Anderson; and a root rot of strawberries, by Anderson and A. S. Colby.

Some aspects of virus disease in plants, J. H. SMITH (*Empire Jour. Expt. Agr., 1 (1933), No. 3, pp. 206–214*).—This is a critical review of present knowledge of this group of diseases—their transmission by insects and in other ways; classification; relationships to hosts, to other diseases, and to environment; and control. It is concluded that although much yet remains to be done both from fundamental and practical aspects, the virus problem "is far from being a hopeless tangle."

Curly top of vegetables investigations, B. F. DANA (*Oreg. State Hort. Soc. Ann. Rpt., 24 (1932), pp. 81–84*).—A summary is given of the status of knowledge of this virus disease of sugar beets, tomatoes, beans, pumpkins, and squashes.

Influence of the nutrient medium on the virulence of fungi, G. E. BUNSCHOTEN (*Invloed van de voeding op de virulentie van schimmels. Proefschr., Rijks-Univ., Utrecht, 1933, pp. [7]+63, pls. [4], figs. 2*).—The question as to whether the virulence of a fungus may be influenced by cultivating it on various nutrient media was studied for *Sclerotinia sclerotiorum* and *Rhizoctonia solani*, and the virulence was tested by inoculation experiments. Tomato seedlings were inoculated with *Sclerotinia* and seedlings of *Brassica chinensis* with *Rhizoctonia*, and the fungi were cultivated on various culture media. Comparative experiments with *Sclerotinia* on media containing different nitrogen compounds (with saccharose as the carbon source) showed that the fungus was very virulent when it had been grown on a medium containing sulfate of ammonia, whereas when the medium contained peptone the virulence decreased and there was hardly any difference in the other cases.

In experiments where the influence of carbon compounds was studied (with sulfate of ammonia as the nitrogen source), a decrease in virulence was evident when the medium contained cellulose, gum arabic, or soluble starch. In the other cases there was hardly any difference. The age of the culture plays an important part in consequence of the accumulation of toxic products of metabolism. *Rhizoctonia* showed scarcely any variation in virulence after having been grown on different media.

No difference in virulence was observed in the experiments with various nitrogen compounds. When the fungus had been grown on media containing various carbon compounds, the virulence slightly decreased when it was cultivated on a medium containing lactose. As with *Sclerotinia*, the age of the culture was of importance.—(*Courtesy Biol. Abs.*)

Leptosphaeria salvinii, the ascigerous stage of Helminthosporium sigmoideum and Sclerotium oryzae, E. C. Tullis (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 9, pp. 675–687, figs. 6*).—*L. salvinii* was found to be the ascigerous stage of *S. oryzae* and of *H. sigmoideum* in cooperative investigations by the U.S. Department of Agriculture and the Arkansas, Louisiana, and Texas Experiment Stations. The various stages of the fungus are described and illustrated, and its hosts, geographic distribution, and seasonal development are discussed.

Biological specialization in Phytophthora infestans [trans. title], K. O. Müller (*Angew. Bot., 15* (*1933*), *No. 1, pp. 84–96*).—An unknown form of *Phytophthora* was found in northern Germany which differed from all known races in that it was able to attack not only the cultivated varieties of central Europe but also those resistant varieties bred by the author. The new form undoubtedly belongs to *P. infestans*, as no morphological differences exist between it and previously known forms.

From a review of earlier observations, it is concluded that the problem is not one of biological specialization of the fungus.—(*Courtesy Biol. Abs.*)

Annotated index of the rusts of Colombia, F. D. Kern, H. W. Thurston, Jr., and H. H. Whetzel (*Mycologia, 25* (*1933*), *No. 6, pp. 448–503*).—This is a joint contribution from the Pennsylvania State College and Cornell University.

Absence of chlorophyll and enzyme action.—I, Catalase action in streak and mosaic disease [trans. title], V. L. Rischkow and I. K. Karatschewsky (*Beitr. Biol. Pflanz., 20* (*1933*), *No. 3, pp. 199–220, fig. 1.*)—The authors include a review of what is known regarding the action of catalase and other enzymes in connection with plants affected with various types of virus diseases. Plants used in the investigation included *Pelargonium zonale, Eulalia japonica, Zea mays japonica, Acer negundo, Mirabilis jalapa, Ligustrum vulgare, Ulmus campestris, Phalaris arundinacea, Vinca major*, several species of *Abutilon, Aspidistra elatior*, and *Hemerocallis fulva.*

In 12 of the white and yellow variegated forms studied, the catalase activity of the variegated areas was much less than the green. In several cases the difference was considerable, as *Z. japonica*, where the ratio was 1:11.7. No difference was found in the catalase activity of the normal and mottled areas of the light green variegated leaf of *M. jalapa*. The addition of sugar to the light green portions of a leaf made no change in the ratio of catalase action, yet in both cases catalase activity was noticeably reduced. Likewise, the addition of 0.001 percent ethyl alcohol to the plant extract and of albumin to the normal and variegated portions of a leaf produced no change. In potato streak, potato mosaic of tomato, and in fernleaf of tomato catalase activity was lower than in healthy plants, averaging about 1:2.7.—(*Courtesy Biol. Abs.*)

Some effects of Bordeaux mixture on transpiration, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 165* (*1933*), *pp. 147–151, fig. 1*).—Observations at the Ohio Experiment Station on Coleus plants sprayed with Bordeaux mixture showed similar stomatal response whether the spray was applied to both surfaces of the leaf or to the upper or lower alone. However, water loss from transpiration was greatly increased during the night in the plants sprayed on both surfaces or on the lower surface. During the day the controls actually lost more water than the sprayed plants, excepting the upper surface lot. Bordeaux spray increased the transpiration rate to a greater extent on cloudy days than on bright sunny days, suggesting that the accelerating influence of Bordeaux mixture is largely confined to cuticular transpiration.

Foot rots in cereals, W. Blauberg (*Beiträge zur Erforschung der Fusskrankheiten des Getreides. Inaug. Diss., Landw. Hochsch., Bonn-Poppelsdorf, 1930, pp. 44*).—The behavior of *Ophiobolus graminis, Fusarium culmorum,* and *F. avenaceum* is appreciably influenced by soil nutrients and environmental factors. Deficiency in nutrient materials tends to increase the injury caused by these foot rots, whereas an abundance lessens the severity of their attack. Copious quantities of nitrogen and phosphoric acid have an ameliorative effect, perhaps because they stimulate greatly the reproductive ability of the root system. The same is true, to a somewhat lesser extent, of potash. Soil type exerts but a slight effect on the severity of attack. The contrast in the effect of unfertilized light and heavy soils is conditioned by the natural food content of the soils concerned. Other factors contributing to the severity of infection are weather and crop rotation. Foot rots seem to be worse under excessive soil moisture. Barley, rye, wheat, and, in many cases, clover, have a very deleterious effect on wheat and rye succeeding them, but the latter are only moderately affected by other crops, crop mixtures, or fallow ground preceding them. The most desirable rotation sequence consists of oats and cultivated crops preceding wheat or rye. In general, the control measures for foot rots are very much the same as those recommended for good cultural practices, namely, early application of well balanced artificial fertilizers, proper planning of crop rotation sequences, and avoidance of excess soil moisture and unfavorable physical condition of the soil.—(*Courtesy Biol. Abs.*)

Stripe resistance and yield of smooth-awned barley hybrids, R. G. Shands, B. D. Leith, J. G. Dickson, and H. L. Shands (*Wisconsin Sta. Res. Bul. 116 (1933), pp. 22, figs. 6*).—Yields and other agronomic features of good selections obtained in the production of white barbless barley from crosses between the black smooth Leiorrhynchum barley and Pedigree Oderbrucker have been noted (E.S.R., 66, p. 133). Stripe resistance studies showed that certain stable lines selected from the crosses were resistant to barley stripe (*Helminthosporium gramineum*), the selections varying from highly resistant to susceptible. Stripe infection in a given selection seemed to be correlated with environment during flowering and seedling stages. A given line was observed to fluctuate widely in stripe infection and stripe development under different environmental conditions, while the same environment appeared to affect stripe development differently in the various selections.

No significant difference in the resistance of these varieties to scab (*Gibberella saubinetii*) was observed.

A study of the relation of environment to the development of the uredinial and telial stages of the physiologic forms of Puccinia graminis avenae Erikss. and Henn, W. L. Gordon (*Sci. Agr., 14 (1933), No. 4, pp. 184–237, pls. 5, figs. 19*).—Physiologic forms 1, 2, 3, 4, 5, 6, 7, 8, and 9 of *P. graminis avenae* were isolated from 1,070 collections of oat stem rust in Canada during the period 1925–30. In 1931, forms 6 and 7, yellow in color, were isolated from cultures from an artificially inoculated barberry. Of 1,257 isolations made in Canada dring the period mentioned, 1,213 consisted of forms 1, 2, and 5.

Studies carried on at the Dominion Rust Research Laboratory and at the University of Wisconsin, largely at controlled temperatures within the range of from 12° to 28° C., revealed that the temperature at which Victory, White Russian, Richland, and Joanette Strain oats are grown prior to inoculation in the seedling stage has no appreciable effect on the types of uredinial infection produced on them later by forms 1, 2, 3, 4, and 5. No significant changes were induced by temperature in the types of uredinial infection produced by forms 2, 6, 7, 8, and 9 on Victory, White Russian, Richland, and Joanette Strain oats or in the types of uredinial infection produced by forms 1, 3, 4, and 5 on Victory, White Russian, and Richland. However, the types of uredinial infection produced by forms 1, 3, 4, and 5 on the differential host, Joanette Strain, were profoundly changed by temperature. Certain physiologic forms can be distinguished from one another only on Joanette Strain and only when this host is kept at a relatively low temperature (12°).

Temperature appeared to be an important factor in the formation of teliospores in *P. graminis avenae*. All the physiologic forms developed teliospores faster on both seedling and mature plants at relatively high (24° to 28°) than at low temperatures (12° to 16°). Forms 3, 4, 6, 7, 8, and 9 formed teliospores much faster than forms 1, 2, and 5. Since the former group of physiologic forms is more virulent than the latter, a correlation between pathogenicity and rapidity of teliospore formation was indicated. The rarity of forms 3, 4, 6, 7, 8, and 9 in Canada might be due to the early development of telia. Thus the uredinial period is reduced and the amount of inoculum is greatly diminished. The stage of development of the host was not shown to be a limiting factor in the formation of teliospores by any of the physiologic forms. A high relative humidity (80 percent) was found to increase both the extent and the rate of telial development on seedlings, while the rate of telial development on mature plants was slightly increased by a low relative humidity (40 percent). Ultraviolet radiation produced no significant changes in the uredinial or telial development of the physiologic forms.

Contribution to the knowledge and significance of Lolium fungi [trans. title], J. Günnewig (*Beitr. Biol. Pflanz., 20 (1933), No. 3, pp. 227-254*).—Identical fungus cultures were obtained from seeds of *L. temulentum* and from *L. multiflorum* by seed sterilization with calcium hypochloride and bouillon culture. Fructification of cultures on malt agar (with calcium malate) and on *Lolium* straw were determined as *Chaetomium kunzeanum*. Numerous experiments on reinfection were unsuccessful. It is improbable that the isolated fungus can fix atmospheric nitrogen. In *L. multiflorum* (biennial) infected plants bear infected heads the first year and fungus-free normal heads the second year, while fungus-free plants bear no ears the first year. There was no morphologic effect on *L. temulentum*.

Wheat smuts and their control, J. A. Faris, V. F. Tapke, and H. A. Rodenhiser (*U.S. Dept. Agr., Farmers' Bul. 1711 (1933), pp. II+17, figs. 11*).—This revision of Farmers' Bulletin 1540 (E.S.R., 58, p. 650), describes stinking smuts or bunts (*Tilletia tritici, T. levis*), loose smut (*Ustilago tritici*), and flag smut (*Urocystis tritici*), outlines control methods, and indicates resistant varieties.

Some investigations on wheat smut (Tilletia spp.) [trans. title], B. Schelotto (*Bol. Chacra Expt. "La Previsión" [Argentina], 1 (1933), No. 4, pp. 40-47, figs. 3*).—Varietal infections was studied in 14 varieties of Argentina and foreign pedigreed wheats, and a probable filtering action of the varietal specific spores was found. Another test verified the resistance to age and virulence of the spores kept in the laboratory over a period of three years. An experiment on infection with spores from different localities in Argentina and one from England indicated that there exist distinct biotypes in each of the populations.—(*Courtesy Biol. Abs.*)

The possibility of separating strains resistant to smut among the common varieties of wheat [trans. title], O. Munerati (*Italia Agr., 70 (1933),* *No. 4, pp. 383–385, fig. 1*).—Seeds of 300 Red Gentile wheat plants, both diseased and free from smut, were planted and records kept of the plants which matured. All showed practically the same degree of infection, no indication of resistant strains being evident.—(*Courtesy Biol. Abs.*)

Varietal resistance and susceptibility of wheats to flag smut (Urocystis tritici Koern), T. F. Yu, H. K. Chen, and L. Hwang (*Univ. Nanking, Col. Agr. and Forestry Bul. 9, n. ser. (1933), pp. 18*).—In this study, reported in English, a large number of wheat varieties secured from China, the United States, Germany, Australia, and Canada were tested for resistance to flag smut (*U. tritici*) in Nanking, China. There were 1 Chinese, 1 German, and 178 American wheat varieties that remained smut free for 7 yr. Two Australian wheats showed no smut for 5 yr.

The foreign wheats are usually late in maturity but more resistant to flag smut than the Chinese.

Alfalfa yellows, F. L. Graber and V. G. Sprague (*Science, 78 (1933), No. 2026, pp. 385, 386*).—This report of observations and experiments at the University of Wisconsin shows that in Wisconsin the stunting and yellowing of alfalfa associated with leafhoppers (*Empoasca fabae*) appears primarily in the second growth. It is definitely associated with increased populations resulting from early cutting of the first crop.

Chocolate spot of broad beans, C. J. Magee (*Agr. Gaz. N.S. Wales, 44 (1933), No. 8, p. 580, fig. 1*).—Typical spots were produced experimentally by infesting plants with aphids. Where colonies of *Aphis rumicus* were established on plants, droplets of honeydew collected on the leaves and dried to form glistening smears. Spots typical of those seen in the field developed beneath these smears after about two days.

It is concluded that the spots are not symptoms of an infectious disease, as was formerly supposed.

Fusarium resistance in Wisconsin Hollander cabbage, M. E. Anderson (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 9, pp. 639–661, figs. 4*).—Cooperative studies conducted by the University of Wisconsin and the U.S. Department of Agriculture, using commercial stocks of the Wisconsin Hollander cabbage, indicated that this variety is of a heterozygous nature. Under severe field conditions the individuals of F_1 progenies from self-pollinated plants ranged all the way from completely susceptible to highly resistant, suggesting the existence of modifying factors for resistance. Although greater uniformity in resistance to yellows was found among the individuals of F_1 progenies obtained by self-pollination than in general stocks, segregation of factors for resistance took place in the F_1 and F_2 progenies; in fact, some F_2 progenies showed a higher degree of resistance and others a lower degree than did the progenies from which the mother plants were selected.

That environmental factors, particularly soil temperature, bear on resistance was indicated in a sharp decline in resistance in several lines from the cool season of 1930 to the warm summer of 1931. The most resistant strains obtained in the study became 100 percent diseased at a constant soil temperature of 24° C. (75.2° F.). The age of the plant did not appear to be a factor in its reaction to the organism.

Red-clover failure in relation to anthracnose in the southern part of the clover belt, A. J. Pieters and E. A. Hollowell (*U.S. Dept. Agr. Leaflet 98 (1933), pp. II+5, figs. 3*).—Published as a revision of and superseding Farmers' Bulletin 1510 (E.S.R., 56, p. 244), this leaflet describes a red clover disease prevalent in some southern States and discusses the use of resistant strains.

The effect of tillage on eradication of cotton root rot, H. E. Rea (*Jour. Amer. Soc. Agron., 25 (1933), No. 11, pp. 764–771*).—From 1927 to 1930, inclusive, the Texas Experiment Station conducted field experiments with farmers in different parts of the Blackland Prairie region on the effect of tillage treatments designed to eradicate host plants on the development and control of *Phymatotrichum omnivorum*. The tillage treatments reduced and eradicated the stand of host plants in proportion to the intensity and duration of the treatments used, but the change in root rot infection during the experiments was not consistently associated with the reduction in the stand of host plants. However, only a small percentage of the root rot infection surviving the more drastic tillage treatments was carried over on the live roots of host plants. Probably the sclerotia which matured before the treatment became effective were responsible for the carry-over. The sclerotia are developed in the vegetative strands of the fungus, and the death of these strands follows the death of the host plant. In reducing the stand of host plants in proportion to the severity of the treatment used, these tillage experiments demonstrated that the root rot disease may eventually be controlled by clean farming.—(*Courtesy Biol. Abs.*)

Eggplant wilt, J. K. Richardson (*Sci. Agr., 14 (1933), No. 3, pp. 120–130, pls. 4*).—Wilt of eggplants, which is of general occurrence and to which no varieties now known show any appreciable resistance, is ascribed to a fungus tentatively identified as *Verticillium dahliae*. The pathogen is a vascular parasite and may be isolated from all parts of the plant, including the seed. It will grow at from 8° to 34° C., and at from pH 2.3 to pH 9, but optimum growth occurs at from 21° to 24° and above pH 5.4. Vascular discoloration has been observed in the roots, main and secondary stems, leaves, fruit pedicels, and fruit, although it does not always show in all parts of a diseased plant.

Applications of different fertilizers had no controlling effect. The addition of a solution of mercuric chloride to the soil prior to setting out the plants, with additional subsequent applications, showed definite control under greenhouse conditions and a considerable retarding effect on the progress of the disease in the field. Applications to the soil of cultures of organisms showing an antagonistic reaction to *Verticillium* in vitro have not yet proved effective for control. Other control measures are suggested.

Occurrence of sterile plants in Bengal gram (Cicer arietinum), V. Ramanatha Ayyar and R. Balasubrahmanyan (*Madras Agr. Jour., 21 (1933), No. 9, pp. 392, 393, pl. 1*).—The presence of sterile plants during 3 seasons is reported, in some cases reaching as high as 15 percent of the plants. No fungus or insect attack could be related to the phenomenon, nor could climatic factors be etiologically concerned, since weather conditions were varied during the 3 years under observation. By elimination, the authors believe the abnormality to be due to a virus or to physiological factors. Cross inoculations on a small scale produced no results. Etiological studies are being continued.

Parasitism, morphology, and physiology of Fusarium solani on onions [trans. title], S. J. du Plessis (*Ann. Univ. Stellenbosch, 10 (1932), A, No 2, pp. 19, figs. 4; Eng. abs., p. 18*).—*F. solani* is recorded for the first time as the cause of a storage rot of onions. It does not attack growing plants. The morphology of the fungus was studied in detail and physiological studies were made on its growth on different media and under various concentrations of acidity and alkalinity. The optimum temperature was from 27.5° to 28.5° C.—(*Courtesy Biol. Abs.*)

One hundred years of the potato disease: A critical retrospect [trans. title], M. Hollrung (*Kühn Arch., 33 (1932), pp. 27–122, figs. 3*).—This is a monographic review of *Phytophthora* blight (1769–1932), covering studies of the causal organism and its spread and pathogenesis in all their phases, and factors influencing the disease and its control. A list is given of the most important milestones in the history of the disease, an extensive author index of papers on it, and a chronological list of the authors.

Internal brown fleck of potatoes, J. E. van der PLANK (*Farming in So. Africa, 8 (1933), No. 91, pp. 383, 384, fig. 1*).—The author gives an account of the occurrence, symptoms, and control of the disease in South Africa.

Soil acidity and scab control, A. L. PIERSTORFF (*Ohio Veg. Growers' Assoc. Proc., 18 (1933), pp. 87–93*).—From experiments here described from the Ohio State University and a review of the literature, it is concluded that tubers free from scab should be planted, or else such tubers should be treated before planting. If possible, soils which have not produced scabby crops should be used for future potato fields. If scab-infected soils must be used, $(NH_4)_2SO_4$ should be the source of nitrogen in the fertilizer. If manure is added to the soil, it should be put on before January 1. If possible, a green cover crop should be turned down just preceding the planting of the crop. Lime or other alkaline materials should not be added to the soil unless the pH is lower than 5. Before any lime is added to fields which are to be used for potatoes, a careful test of the soil should be made. Potato fields should be adjusted to from pH 5.2 to 5.5 as nearly as possible. Sulfur should decrease the percentage of scabby tubers on the lighter types of soils, but the use of sulfur on the heavier soil types or muck land is still in the experimental stage and further information needs to be obtained.

A sugary exudation from sorghum, T. R. SESHADRI (*Madras Agr. Jour., 21 (1933), No. 9, pp. 394–396*).—Analyses are reported of a sweet fluid found to exude from the ear head of certain plants from the beginning of the flowering season in a variety of sweet sorghum called Tella Jonna. This exudation frequently collects and dries on the leaves and attracts large numbers of insects. Usually it is a sticky semisolid. When this secretion takes place the ear head remains small and undeveloped, though in all other respects the plant may appear normal.

Effect of mosaic on the tonnage and the juice of sugarcane in Pusa, W. MCRAE (*Indian Jour. Agr. Sci., 1 (1931), No. 5, pp. 527–533*).—Coimbatore seedling canes were used in replicated plats where adjacent plats of mosaic and mosaic-free canes were planted for comparison. Secondary infection was so slight that it did not interfere with the test.

The results from the tests in the season of 1930–31 show that in Pusa, under the conditions of that season, the mosaic disease caused a small loss in tonnage and, in one of the two varieties tested, a small loss in purity. General observation and comparative records of yields indicate that the other Coimbatore seedling canes grown on a field scale in Pusa behave in much the same way. Although quite susceptible to mosaic, they are highly tolerant.—(*Courtesy Biol. Abs.*)

The kromnek disease of tobacco and tomato in the eastern Cape Province, E. S. MOORE (*Farming in So. Africa, 8 (1933), No. 91, pp. 379, 380, figs. 3*).—In this virus disease of tobacco and tomato the chief, if not the only, vector seems to be a thrips (*Frankliniella*). No variety of tobacco or tomato has thus far been found to show any consistently marked degree of resistance.

Present knowledge of tobacco virus diseases, especially mosaic [trans. title], A. TROTTER (*Bol. Tec. [R. Ist. Sper. Coltiv. Tabacchi, Scafati], 30 (1933), No. 2, pp. 81–104*).—A general review, with a bibliography of 74 titles.

Fungicidal experiments for the control of blue mould of tobacco, L. F. MANDELSON (*Queensland Agr. Jour., 40 (1933), No. 6, pp. 470–494, figs. 3*).—Six fungicide experiments for the control of blue mold of tobacco, carried out in the Brisbane district in 1932–33, are discussed. Since tobacco seedlings are difficult to spray efficiently owing to the fine tomentose covering of the leaves and to the low-lying habit of the young plants, particular attention was paid to the use of spreading agents, to fungicides in an extremely fine state of division, and to the manner of spraying.

In preliminary trials under normal field conditions, several sprays were found superior to dusts, copper emulsion being the most promising. "Agral No. 1", potash soft soap, and molasses were found most suitable as spreading agents for Bordeaux mixture. These results were confirmed in further trials where seedlings were inoculated artificially and grown under conditions very conducive to the development of blue mold. Home-made colloidal copper with soft soap as a spreader was found most suitable as a fungicide for tobacco seedlings. Copper emulsion, which was tested more thoroughly than colloidal copper and was also tried out commercially in the Brisbane district, gave consistently rather satisfactory results, but required considerable care in preparation. The most suitable strengths and times and methods of application were also investigated.

Collar rot of tomatoes, W. A. Kreutzer and L. W. Durrell (*Colorado Sta. Bul. 402 (1933), pp. 12, figs. 6*).—First observed in Colorado in the summer of 1931 on imported plants, collar rot, caused by the soil-borne fungus *Macrosporium solani*, which enters the succulent stems of seedling tomatoes and gradually destroys the outer tissues, is described and discussed with respect to temperature and moisture relationships, soil infection, varietal susceptibility, and control.

A low moisture content in the soil tended to promote the recovery of infected seedlings. In heavily inoculated soil the percentage of germination was materially reduced. However, spore suspensions mixed with the soil caused little infection, it being apparent that the fungus must actually grow in the soil and contact the tomato stem. Maximum infection was secured in 1-week-old transplants. The danger of field infection from diseased to healthy plants is minimized by the time required by the fungus to migrate through the soil. Injured plants set deeply in the soil put forth new roots from above the wounds. Sprays, dusts, and seed treatments are conceded of no value in the control of collar rot.

Bitter pit of apples [trans. title], B. Peyronel (*Bul. R. Soc. Toscana Ortic., 4. ser., 17 (1932), No. 11–12, pp. 151–159, pl. 1*).—The diagnosis, extent of damage, predisposing causes, etiology, and control measures are discussed.

Canker and die-back of apples associated with Valsa ambiens, L. Ogilvie (*Jour. Pomol. and Hort. Sci., 11 (1933), No. 3, pp. 205–213*).—Die-back was associated with wet winter weather and water-logged soils. Fructification of *Cytospora* sp. occurred on wedge-shaped cankers at the bases of trees and on small cankers following branch injury. Inoculations of pure cultures of the *Cytospora* into healthy twigs were unsuccessful, but such inoculations in small areas of twigs previously burned resulted in a penetration of the fungus for several inches into healthy wood. *Cytospora* pustules were produced on the inoculated twigs, and subsequently perithecia of *V. ambiens* appeared. Single-spore isolation of the latter gave identical cultures which produced *Cytospora* spores. The *Cytospora* was identified as *C. ambiens*.

It is concluded that *V. ambiens* is a weak parasite incapable of attacking healthy trees, but capable of becoming established in necrotic areas with consequent invasion of healthy tissues to some extent.—(*Courtesy Biol. Abs.*)

Apple scab spraying experiments in the Wisbech area: The times for application, W. F. Cheal (*Jour. Min. Agr. [Gt. Brit.], 39 (1933), No. 11, pp.*

993–999, pls. 2).—Two preblossom (green-flower and pink-bud) applications of lime-sulfur 1–30 and 2 postblossom (petal-fall and 1 to 3 weeks later) applications of lime-sulfur 1–60 gave better scab control on Worcester Pearmain than 1 preblossom and 2 postblossom applications in 2 years' trials.

Emphasis is laid on the importance of the green-flower application for apple scab control in a bad scab year. Lime-sulfur is preferred to Bordeaux mixture on this variety on account of better colored fruit and less injury from red mite.—(*Courtesy Biol. Abs.*)

Apple and pear scab in East Anglia, W. A. R. DILLON WESTON and F. R. PETHERBRIDGE (*Jour. Pomol. and Hort. Sci., 11* (*1933*), *No. 3, pp. 185–198, pls. 2*).—Results of spore trapping experiments with *Venturia inaequalis* and *V. pyrina* showed that ascospores were rarely trapped in or near the trees, and that they were not found until after the primary infection by conidia had taken place. Pustules on the 1-yr.-old spur wood and on 1-yr.-old nonfruiting wood were responsible for the primary infection which took place very early. The lateral spread of conidia in rain splashes is considered important. Aphids are carriers of scab spores.

Scab is more readily controlled by one preblossom spraying on varieties which are not susceptible to wood infection than on wood-susceptible varieties. Two preblossom applications may give more satisfactory results on trees which have heavy wood infection, and in some cases an extra preblossom spraying may be well worth while. Postblossom sprayings are of importance in checking infestations caused by the washing down of conidia from the leaves, and such applications are important in varieties on which wood pustules are formed.—(*Courtesy Biol. Abs.*)

Studies on black spot disease of the Japanese pear (Pirus serotina Rehd.), S. TANAKA (*Mem. Col. Agr., Kyoto Imp. Univ., No. 28* (*1933*), *pp. 31, pls. 2, figs. 5*).—The black spot disease of Japanese pears is known to be prevalent throughout Japan and Chosen (Korea) and causes especially serious damage to Nijisseiki, the finest variety of this fruit. The infection by the causal fungus (*Alternaria kikuchiana*) seems to take place through the cuticle, stomata, as well as lenticels, and causes characteristic black spots on the fruit, young leaves, and also on current shoots. The pear varieties such as Inamuraaki, Taihaku, Waseaka, Chojuro, and Okusankichi are highly resistant to the disease, while Nijisseiki, Doitsu, Hakata-ao, and Meigetsu are very susceptible. Four strains of the causal fungus were used in the present investigations, and they are classified into two types, the mycelial and the conidial. In the culture experiment the causal fungus grew most vigorously on soy agar and Japanese soy with onion decoction, while the conidia are produced most abundantly on pear decoction agar. The optimum temperature for the growth of the causal fungus seems to lie at about 28° C. and the maximum temperature at about 40°, and for the strains of the mycelial type was a little lower than for the conidial type. The optimum H-ion concentration for the mycelial growth is approximately 6.0 in pH value. The infection occurs in air showing higher than 90 percent in relative humidity when the temperatures lie between 24° and 30°. The filtrate of the cultured solutions of the causal fungus contains a kind of toxic substance which is thermolabile, filtrable through Chamberland's filter F, and nonseparable by a centrifugal separator, and this substance causes brown spots on the pear fruit.

On the causes of apoplexy [wilt?] in stone fruit trees [trans. title], K. SCHILBERSZKY (*Angew. Bot., 15* (*1933*), *No. 2, pp. 105–122*).—Wilt of stone fruit trees is found widely prevalent and at times frequent in middle and northern Europe, killing either single limbs or entire trees. Its frequency is generally related to the peculiar weather conditions of certain years.

Below the portion of the tree affected by wilt there occurs, generally, a gummosis in the wood which, in concrete cases, may be traced into the bark tissues. The wilt is the direct sequence of this gummy thrombosis of the wood vessels, which occasionally may be enhanced by the presence of tyloses and which results in diminished or totally inhibited conduct of sap. The foliage becomes limp, and the tree or branch dries up.

Gummosis is induced, according to circumstances, by an enzyme causing fermentative processes in certain cells whereby the cell walls become hydrolized, the albumen of the protoplasm is changed, and finally the entire cell becomes liquefied. Thrombosis of the vascular lumina results from the penetration of gummy substances. The gum produced by Amygdalaceae is insoluble in water, hence its interference with the normal flow of sap. When the causal ecological conditions are mild, there result but local centers of gummosis which do not progress further and which may heal. The gum in Amygdalaceae is a reaction product to unfavorable conditions, e.g., frost, unsuitable soil conditions, wounds, errors in grafting, unsuitable stock, or parasitic affections.

Infection experiments with conidia, as well as with ascospores, proved that *Valsa* fungi encountered are not true parasites but are able to attack only weakened trees. In many wilting trees no fungi could be detected.

The protective measures are (1) protection against frost, (2) the application of lime to the soil when necessary, (3) avoidance of unnecessary root or crown injuries, (4) drainage, (5) sufficient water supply during dry periods, and (6) prophylactic measures against fungus infections.—(*Courtesy Biol. Abs.*)

Mosaic disease of the raspberry in Great Britain.—I, Symptoms and varietal susceptibility, R. V. Harris (*Jour. Pomol. and Hort. Sci., 11 (1933), No. 3, pp. 237–255, pls. 3*).—An outline is given of the investigation of raspberry mosaic disease started at East Malling in 1921, and the results are compared with recent work on raspberry virus diseases in America and Europe. Varieties differed consistently in the nature and intensity of the mosaic leaf symptoms, in the relative proportion of stools showing these symptoms, and in the degree of stunting of affected stools. In the Baumforth Seedling B variety, plantings of every mosaic cane produced a stool showing similar symptoms and no cases of natural recovery occurred subsequently. On the stools derived from healthy canes no symptoms appeared the first season, but subsequently a small proportion of the stools developed symptoms every season. The stools with mosaic symptoms were less vigorous than those free from the symptoms, but the rapidity and degree of the loss of vigor varied.

It is concluded that the mosaic leaf symptoms were caused primarily by a principle inherent in the plant, that this principle invariably persisted in the infected plant and its progeny, and that its presence was associated with a steady loss of vigor. That the symptoms were due to a virus was confirmed by inducing leaf mottlings by grafting portions of mosaic canes of Baumforth Seedling B on healthy plants of the same variety. Attempts to transmit the symptoms by transferring expressed juice from mosaic plants to healthy plants and investigation relating to possible insect vectors of the disease yielded negative results. The variation in the symptoms found made it possible to arrange them in three main types. More than one type of symptom may occur on the same variety.

In contrast with virus diseases of black raspberries in America, no necrosis of a stool which could be ascribed directly to the action of the virus was found. The indications are that varieties are infected by more than one distinct form of mosaic disease. Leaf symptoms of certain varieties may remain suppressed for considerable periods after infections. There is probably little relation between the apparent and actual susceptibility and infectibility of certain varieties.

As a result of the experiment, the importance of supplying the grower with mosaic-free canes is recognized.—(*Courtesy Biol. Abs.*)

A preliminary note on cacao disease in the Dumbara Valley, 1933, M. Park (*Trop. Agr.* [*Ceylon*], *81* (*1933*), *No. 4, pp. 207–211*).—A form of stem disease which causes the trees to wilt and die rapidly is noted. The cause is not known, but there is some evidence that its severity is correlated with the unusually wet weather experienced in 1933. The disease is thought to be one that has existed in Ceylon for a long time.

Spraying of coffee in south India, W. W. Mayne, M. J. Narasimhan, and K. H. Sreenivasan (*Mysore Coffee Expt. Sta. Bul. 9* (*1933*), *pp.* [*VII*]+*69, pls. 8*).—The importance of spraying in the control of coffee diseases such as black rot, leaf disease, and die-back, and to a certain extent in the control of the coffee borer is pointed out. Based on the nature of attack and time of appearance of the diseases, experiments were carried out with special reference to leaf disease to find out the right time of spraying and the optimum strength of the mixture. As regards efficacy of different spray mixtures in minimizing percentage infection, 0.5 percent Bordeaux mixture was the cheapest and safest.

Spreaders added to Bordeaux mixture were tested with regard to their effect on the physical properties of the mixture, their efficacy in warding off the disease, and their influence on copper retention on sprayed leaves. It is concluded that Bordeaux mixture with lime caseinate, though not the best, is the most suitable mixture at present. The use of Bordeaux mixture is preferred to that of Burgundy mixture, as regards efficacy against leaf disease and crop yield. Increase in crop yield due to spraying is indicated by data furnished by coffee planters in Mysore, Nilgiris, and Shevaroys.

Considerable attention was devoted to tests of types of spraying machinery, and their advantages and disadvantages are discussed. Attention is drawn to the fact that by a simple device the D.S.P. sprayer of British manufacture can be fitted with 4 lines of hose instead of with 2 as ordinarily.

The lepra explosiva of the orange tree, V. Zeman (*Lepra explosiva del naranjo. Corrientes, Argentina: Univ. Nac. Lit., Facult. Agr., Ganadería e Indus. Afines, 1932, pp. 29, figs. 5*).—This paper comprises a detailed description of the causal agent (*Amylirosa aurantiorum*) with its three metagenetic forms, still little known although widely distributed in the Province of Corrientes, Argentina. The usual methods of disease control have not given satisfactory results but are capable of limiting its extension. Special stress has been laid upon the maintenance of the health of the tree, as healthy trees are never or rarely infested.—(*Courtesy Biol. Abs.*)

Removing Bordeaux spray from oranges: Immersion in hydrochloric acid proved efficient and economical, R. J. Benton and T. N. Powell (*Agr. Gaz. N.S. Wales, 44* (*1933*), *No. 9, pp. 683, 684*).—Results of tests showed this to be an efficient, quick, and economical method of removing the deposit. It is recommended that the fruit be placed in a piece of fish net for immersion to reduce loss of solution and expedite return of acid to the vessel used. After being dipped into clean water the fruit should be transferred to cases from which evaporation of the water will rapidly take place.

The oil treatment of plantain diseases, M. Park (*Trop. Agr.* [*Ceylon*], *81* (*1933*), *No. 2, pp. 86–90*).—In the treatment of bunchy top and Panama disease of plantain [*Musa paradisiaca*] satisfactory control was obtained by cutting down diseased plants to within 4 in. of the ground level and pouring on and around them 1 to 2 pt. of a heavy gas oil (specific gravity 0.864, closed flash point 170°–180° F.). This penetrates the soil and kills the underground portions.

Report of the lily disease investigation fellowship 1932, D. K. O'Leary (*Hort. Soc. New York, Yearbook, 1932, pp. 27–33*).—The author gives a progress report on the season's work on *Botrytis* blight, mosaic, storage and transit rots of bulbs, bulb mites, limberneck disease (cause unknown), and on a stalk rot of *Lilium candidum* due to *Sclerotium delphinii*.

Elm disease [trans. title], E. Marchal (*Bul. Soc. Cent. Forest. Belg., 37 (1930), No. 1, pp. 21–23*).—Recent investigations by J. G. Betrem are cited which show that the elm disease fungus *Graphium ulmi* is spread by adult *Scolytus* during their nuptial flight.

The author urges, as a necessary measure in the control of this dangerous parasite, the vigorous and widespread felling and barking of all trees attacked by *Scolytus*, as well as all those showing signs of the elm disease. The bark and twigs of felled trees should be carefully burned.

The confirmation of an old proverb [trans. title], E. Gäumann (*Ber. Deut. Bot. Gesell., 48 (1930), No. 5, pp. 156–168, figs. 6*).—Spruce and fir trees were felled at monthly intervals throughout a year, and samples of wood were given the following treatments and examined to see how much decay had occurred: (1) After sterilization, exposed to the attack of *Merulius domesticus, Polyporus vaporarius, Coniophora cerebella,* or *Lenzites abietina* for 3, 6, or 12 mo.; (2) dried for a year under shelter and given treatment 1; and (3) exposed to the weather for 12 mo. and treated as in (1). Wood treated as in (1) immediately after cutting was least readily attacked by fungi if cut in the fall or winter, as an old proverb says. The seasonal effect was not found with treatments 2 or 3.—(*Courtesy Biol. Abs.*)

ECONOMIC ZOOLOGY—ENTOMOLOGY

An introduction to the literature of vertebrate zoology, compiled and edited by C. A. Wood (*London: Oxford Univ. Press, 1931, pp. XIX+643, pl. 1; rev. in Science, 78 (1933), No. 2027, pp. 410, 411*).—The first and main section of this introduction consists of a review of the literature of vertebrate zoology from the earliest times to the present, presented in 19 chapters (pp. 1–146). This is followed in the second section by a sudents' and librarians' ready index to short author-titles on vertebrate zoology, arranged in both chronological and geographical order (pp. 147–172). The third and largest section consists of a partially annotated catalog of the vertebrate zoology in the libraries of McGill University (pp. 173–643). The review is by H. C. Oberholser.

The ecology of animals, C. Elton (*London: Methuen & Co., 1933, pp. VII+97*).—This pocket monograph considers the scope of animal ecology, ecological surveys, animal interrelations, habitats, numbers—statistics and dynamics, and economic problems. A list of references and an index are included.

Game conservation (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. 92–94*).—Reference is made to the work of the year at bird-banding stations, protection of waterfowl, migratory bird refuges, and fur farming with silver foxes.

A parasitological survey of the genus Citellus in Manitoba, J. A. McLeod (*Canad. Jour. Res., 9 (1933), No. 2, pp. 108–127, pl. 1, figs. 18*).—The results of findings in a parasitological survey of 236 gophers (*Citellus* spp.) in the Province of Manitoba are here presented in connection with a list of 28 references to the literature.

Mole control, J. Silver and A. W. Moore (*U.S. Dept. Agr., Farmers' Bul. 1716 (1933), pp. II+17, figs. 14*).—This account of mole control supersedes that given in Farmers' Bulletin 1247 (E.S.R., 47, p. 155).

The muskrat (ondatra), its biology and control [trans. title], A. Chappellier (*Min. Agr. [France], Ann. Épiphyties, 19 (1933), No. 3, pp. 143–184, pls. 3, figs. 9*).—The first part of this contribution deals with the general history and biology of the muskrat (pp. 143–161); part 2 with control measures applicable to European conditions, where it has become a serious pest (pp. 163–183).

Destruction of the muskrat (Fiber zibethicus Linné) and the water vole (Arvicola terrestris amphibius L.) by the virus Bacillus typhi murium [trans. title.], A. Chappellier (*Min. Agr. [France], Ann. Épiphyties, 19 (1933), No. 3, pp. 185–206*).—A report of experiments conducted.

A revised list of the birds of Iowa, P. A. DuMont (*Iowa Univ. Studies Nat. Hist., 15 (1933), No. 5, pp. 171, fig. 1*).—This is a revision of the list by Anderson previously noted (E.S.R., 19, p. 251).

Habitat selection in birds, with special reference to the effects of afforestation on the Breckland avifauna, D. Lack (*Jour. Anim. Ecol., 2 (1933), No. 2, pp. 239–262, pls. 2*).—Following a brief introduction, part 1 of this contribution deals with the avifauna of the Breckland, an area of sandy heaths on the borders of Norfolk and Suffolk, England; part 2 with factors limiting distribution; and part 3 with a general discussion of habitat selection. The account includes a list of 22 references to the literature.

Suggestions for pheasant management with special reference to southern Michigan, H. M. Wight (*Lansing: Dept. Conserv., 1933, pp. 25, figs. 9*).—A practical account presented under the headings of pheasant requirements (pp. 3–10) and pheasant management (pp. 10–23).

The care and propagation of ornamental waterfowl, J. C. Laidlay (*Edinburgh: McLagan & Cumming, 1933, pp. 190, figs. 70*).—A practical account of the waterfowl, particularly waterfowl best suited for the ponds and lakes of Great Britain.

The food of the red-billed oxpecker, Buphagus erythrorhynchus (Stanley), R. E. Moreau (*Bul. Ent. Res., 24 (1933), No. 3, pp. 325–335*).—Working in east Africa the author finds the report that the red-billed oxpecker, *B. erythrorhynchus*, does not eat ticks to be inaccurate, since ticks, together with other bloodsucking parasites of stock, form an important, and probably major, part of its diet.

The eggs of Japanese birds, VI, K. Kobayashi and T. Ishizawa (*Rokko, Kobe, Japan: Keisuke Kobayashi, 1933, pp. [1]+67–84, pls. 10*).—This is a continuation of the work previously noted (E.S.R., 70, p. 355).

A check list of North American amphibians and reptiles, L. Stejneger and T. Barbour (*Cambridge: Harvard Univ. Press; London: Humphrey Milford, 1933, 3. ed., pp. XIV+185*).—This is a revised and enlarged edition of the check list previously noted (E.S.R., 51, p. 452).

The biology of the Protozoa, G. N. Calkins (*Philadelphia: Lea & Febiger, 1933, 2. ed, rev., pp. XI+17–607, pls. 2, figs. 223*).—This is a thoroughly revised edition of the work previously noted (E.S.R., 55, p. 758).

Miracidia of the liver fluke for laboratory work, M. W. Jepps (*Nature [London], 132 (1933), No. 3326, p. 171*).—The author describes a procedure for securing miracidia of the liver fluke (*Fasciola hepatica*) which has been in practice for many years in Glasgow and has been found satisfactory.

[Work by the U.S. Department of Agriculture with economic insects and their control, 1933] (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. 79,* *85–90*).—Reference is made to the study of the structural formula of rotenone and efforts to synthesize it for use as a substitute for lead arsenate, the definite determination that *Hibiscus syriacus* may serve as a host of the bollweevil, to pink bollworm production, to the migration of the beet leafhopper and its control, to spotted fever and the American dog tick as a carrier in the eastern United States, to the European corn borer, and to work with insecticide residues.

[Report of work in entomology in Colorado] (*Colorado Sta. Rpt. 1933, pp. 14, 15*).—The work of the year (E.S.R., 68, p. 636) is briefly referred to under the headings of grasshopper control; the relation of the potato psyllid *Paratrioza cockerelli* (Sulc.) to the potato disease known as "psyllid yellows"; codling moth control by means of an egg parasite, *Trichogramma minutum* Riley, and by spraying; and control of the alfalfa webworm *Loxostege commixtalis* Walk. and the cabbage looper.

[Report of work in entomology in Illinois] (*Illinois Sta. Rpt. 1933, pp. 137–163, 236, 237, figs. 4*).—The observations and work of the year in entomology referred to (E.S.R., 68, p. 636), include that by W. P. Flint, W. P. Hayes, G. H. Dungan, J. H. Bigger, F. C. Bauer, J. R. Holbert, J. C. Hackleman, S. C. Chandler, L. H. Shropshire, J. J. Pieper, C. M. Packard, M. D. Farrar, E. R. McGovran, C. C. Compton, E. P. Lewis, F. F. Weinard, A. S. Colby, and R. S. Marsh on resistance of certain strains of corn to the European corn borer and chinch bug, corn rootworm and root aphid control through rotations, protection of the wheat crop against the Hessian fly, protection of peach trees from the peach borer by the use of paradichlorobenzene, the need for additional sprays to control the plum curculio, the spread of the oriental fruit moth, the use of oil dusts to protect peach trees from insects and diseases, codling moth control, San Jose scale control, new insecticides, protection of raspberries from insects, thrips injury to strawberries, protection of the onion and potato crops by the application of sprays, curtailment of cucumber and squash loss by application of calcium arsenate-gypsum dust, repellents for the Mexican bean beetle, reduction of losses in the growing bean crop by the application of Bordeaux spray, control of mushrooms from attacks of the mites *Tyroglyphus lintneri* Osb., *Linopodes antennaepes* Bks., and *Histiostoma gracilipes* Bks., the use of lead arsenate in the destruction of earthworms, economic loss occasioned by greenhouse pests, heated sprays for control of mealybugs, protection of conifer plantings against insects, prevention of insect damage to grass, control of ox warbles, destroying bot eggs on horses, economy of flea control by the use of dormant oil emulsions, and advances in control of raspberry mites and the grape berry moth.

[Contributions on economic insects in British Columbia] (*Ent. Soc. Brit. Columbia, Proc., No. 30 (1933), pp. 8–26*).—The contributions here presented include the following: Materials Used as Canker Paints in Woolly Aphis Control, by A. A. Dennys (pp. 8–10); Notes on a Serious Outbreak of Tick Paralysis in Cattle, by E. Hearle (pp. 11–16); Notes on the Tarnished Plant Bug in the Dry Belt of British Columbia, by E. P. Venables (pp. 17–20); The Identity of the Carnation Maggots of British Columbia, by G. J. Spencer (pp. 21, 22); A Convenient Method of Storing Entomological Specimens in Alcohol, with Particular Reference to Dragonflies, by E. R. Buckell (pp. 23, 24); and Some Food Plants of Lepidopterous Larvae, by J. R. J. Llewellyn Jones (pp. 25, 26).

Department of entomology and zoology (*Ontario Agr. Col. and Expt. Farm Ann. Rpt., 58 (1932), pp. 135–138*).—This is a brief report on several of the more important insects worked with during the year, together with a statement of research and experimental work.

[Reports of the Government entomologist, 1931 and 1932], W. H. EDWARDS (*Jamaica Dept. Agr. Ann. Rpts., 1931, pp. 22–24; 1932, pp. 16–18*).—Accounts are given of the occurrence of and control work with the more important insects in 1931 and 1932 (E.S.R., 66, p. 756).

Entomological work at the Agricultural Experiment Station of La Molina [trans. title], J. WILLE (*Min. Fomento, Dir. Agr. y Ganadería [Peru], Informe No. 20 (1933), pp. 27, figs. 12*).—Contributions are presented on control of the West Indian fruit fly and the protection of fruit against it (pp. 3–23) and the establishment of a colony of vedalia at Huanuco, Peru (pp. 24–27).

[Contributions on economic insects] (*Arb. Biol. Reichsanst. Land u. Forstw., 20 (1933), No. 3, pp. 237–308, 325–390, figs. 44*).—The contributions here presented include the following: The Biology and Rearing of the Ichneumonid Parasite *Angitia armillata* Gr. (Hymenoptera, Ichneumonidae, Ophionini), by I. Beling (pp. 237–244); The Influence of Humidity on the Development of Young Silkworms, by E. Janisch and A. A. A. E. Ghabn (pp. 245–257); The Calculation of the Catenary Curve as an Expression of the Dependence of Vital Phenomena on Temperature, by E. Janisch and H. Maercks (pp. 259–268); Investigations of the Ecology and Epidemiology of the Nun Moth—I, The Dependence of the Developmental Period on Temperature and Humidity, by E. Janisch (pp. 269–290); A contribution to the Control of Insect Pests through the Internal Treatment of Plants—II, The Influence of Potash Fertilizer on the Susceptibility of Apple Trees to Attack by the Woolly Apple Aphid, Apple Aphid, and Mildew (pp. 291–302) (E.S.R., 67, p. 284) and Is There a Hibernating Form of the Woolly Apple Aphid (pp. 303–308), both by O. Jancke; On the Occurrence of the Leaf Gall Phylloxera in Germany up to the Present Time, by C. Börner and F. A. Schilder (pp. 325–346); and The Influence of Temperature and Humidity on the Embryonic Development of the Mediterranean Flour Moth Parasite *Habrobracon juglandis* Ashm., by H. Maercks (pp. 347–390).

Report of the senior entomologist, T. J. ANDERSON (*Kenya Dept. Agr. Ann. Rpt., 1932, pp. 95–110*).—Included in this report is an account by H. C. James on the coffee mealybug, the capsid bug *Lygus simonyi* Reut., and the fringed scale of coffee (*Asterolecanium*), and a report by R. H. Le Pelley on the three most important pests in Kiambu during the period January–June, namely, *L. simonyi*, *Antestia lineaticollis* Stal., and the mealybug *Pseudococcus lilacinus* Ckll.

A list of insects with their parasites and predators in Malaya, compiled by G. H. CORBETT and N. C. E. MILLER (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 13 (1933), pp. [2]+15*).—This list is based on records made in the entomological laboratory of the Straits Settlements and Federated Malay States, 1920–32.

[Annual report of the division of entomology], G. H. CORBETT (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 14 (1933), pp. 39–52*).—This is an account of the economic insects of the year (E.S.R., 69, p. 549), presented under the headings of the crops affected.

Entomology section, J. MUGGERIDGE (*New Zeal. Dept. Agr. Ann. Rpt. 1932–33, pp. 47–49*).—A brief statement is made of the work of the year with economic insects (E.S.R., 69, p. 549).

The shielding effects of various materials when insects are exposed to the lines of force in a high frequency electro-static field, L. PYENSON (*Jour. N.Y. Ent. Soc., 41 (1933), No. 3, pp. 241–252*).—Investigational work at the New Jersey Experiment Stations has shown that the lethal effect of lines of force in a high-frequency electrostatic field is limited in solid dielectrics mostly by moisture content, and in pure liquids by the dielectric constant. Electrical conducting substances, whether liquid or solid, act as shields to insects when they are exposed to the lines of force between the plates. The work has shown it to be possible to destroy insects in many substances without injuring the materials with excessive heat. These substances are mainly soils with a limited amount of moisture, woody materials, tobacco, grains or seeds, breakfast foods, clothes, flours, paper, cellulose compounds, and nuts.

Greenhouse fumigations with naphthalene solutions, F. Wilcoxon, A. Hartzell, and W. J. Youden (*Contrib. Boyce Thompson Inst., 5 (1933), No. 4, pp. 461–469, figs. 3*).—This continuation of earlier work on fumigation with naphthalene (E.S.R., 63, p. 847) describes another method which permits the control of the concentration of naphthalene vapor and insures that the desired concentration will be maintained throughout the fumigation period. This method involves the continued recirculation of the greenhouse air through a saturator containing a solution of naphthalene in an inert solvent. The concentration of the naphthalene in the solvent determines the maximum concentration which can be reached in the greenhouse air.

A saturator is described and illustrated for use with solutions of naphthalene in oil, which brings about intimate contact of the greenhouse air with the solution used. Experiments were also performed with a solid solution of naphthalene in sulfur, using a special apparatus. Satisfactory control of the common red spider could be obtained by both these methods by fumigating for from 14 to 16 hr. without injury to plants usually considered sensitive to naphthalene fumigation.

Pyrethrum flowers, C. B. Gnadinger (*Minneapolis, Minn.: McLaughlin Gormley King Co., 1933, pp. XI+269, figs. 49*).—The several phases of this work on pyrethrum and its use as an insecticide are as follows: Description and history (pp. 1–4); commercial sources (pp. 5–20); active principles (pp. 21–36); evaluation by chemical methods (pp. 37–67) and by biological methods (pp. 68–90); correlation of chemical assays and biological tests (pp. 91–109); comparative value of commercial grades (pp. 110–126); effect of storage, light, and heat (pp. 127–134); adulteration (pp. 135–140); powdered and ground pyrethrum (pp. 141–145); manufacture of pyrethrum extracts (pp. 146–158); pyrethrum household insecticides (pp. 159–179), livestock sprays (pp. 180–188), horticultural powders, dusts, and sprays (pp. 189–211), and miscellaneous uses (pp. 212–216); and a possible source of pyrethrum flowers in the United States (pp. 217–230). A bibliography of 604 titles is included.

Preliminary notes on some entomogenous fungi in Egypt, R. M. Nattrass (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 120 (1932), pp. [3]+9, pls. 6*).—These notes relate to entomogenous fungi of the genus *Empusa* on *Euprepocnemis plorans* Charp. and the cotton worm *Prodenia litura* F.; the genus *Aspergillus* on the sugarcane mealybug *Pseudococcus sacchari* Ckll.; and the genera *Beauvaria*, *Metarrhizium*, and *Mucor* on *Anacridium aegyptium* L.

Experiments with baits for the control of certain cotton pests, D. O. Atherton (*Queensland Agr. Jour., 40 (1933), No. 3, pp. 183–190, figs. 2*).—None of the baits used in the work here reported, which included molasses and water and honey and water sirups with the addition of other substances such as sodium arsenite, kerosene, aqueous extract of quassia chips, amyl acetate, and ethyl acetate, were effective against the corn ear worm. A sirup of molasses and water containing sodium arsenite at the rate of 6.5 oz. per gallon gave promise as a bait for the cotton looper moths *Antarchaea chionosticta* Turn.

Some important insect problems connected with the cultivation of rice in south India, T. V. Ramakrishna Ayyar (*Agr. and Livestock in India, 3*

(1933), No. 4, pp. 341–351, pls. 7).—In this contribution the author considers the main insect problems connected with paddy in south India. A Madras paddy pests calendar in colors is included.

The chief insect pests of sugarcane and methods for their control, P. V. Isaac and C. S. Misra (*Agr. and Livestock in India, 3 (1933), No. 4, pp. 315–324, pls. 2*).—This practical account dealing with the more important insect enemies of sugarcane in India is illustrated by two colored plates.

Sugarcane insects and problems connected with them in south India, T. V. Ramakrishna Ayyar (*Madras Agr. Jour., 21 (1933), No. 10, pp. 421–430, pl. 1*).—A digest of sugarcane insect problems as related to the south of India.

The relation of insect activities to forest development as exemplified in the forests of eastern North America, J. M. Swaine (*Sci. Agr., 14 (1933), No. 1, pp. 8–31*).—A contribution presented at the annual meeting of the Entomological Society of America, held at Atlantic City, N. J., in December 1932.

Tables for identification of the most important insect larvae occurring in the soil of pine forests, D. von Butovitsch and W. Lehner (*Bestimmungstabelle der wichtigsten in märkischen Kiefernwaldböden vorkommenden Insektenlarven. Berlin: Julius Springer, 1933, pp. 16*).—The identification of insect larvae found in soil of pine forests is presented in tabular form.

Japanese beetle suppression work in New Jersey (*Jour. N.Y. Ent. Soc., 41 (1933), No. 3, pp. 404, 405*).—Brief reference is here made to an account by E. G. Rex on work conducted during 1932 by the New Jersey Department of Agriculture in cooperation with the U.S. Department of Agriculture, in which mechanical funnel traps were employed in the suppression of the Japanese beetle. In the region of about 75 sq. miles in Salem County around Mullica Hill and in Cumberland County around Bridgeton from June 28 to August 4 on 325 farms, 856 bbl. of 50 gal. each were filled with beetles estimated to be about 526,000,000 in number. The bait used consisted of bran impregnated with molasses, geraniol specially prepared, glycerin, and water.

A biological study of an orange-brown galerucid pest of cucurbits, C. Kwai-shang (*Lingnan Sci. Jour., 12 (1933), No. 4, pp. 577–592*).—This is a contribution upon a beetle, probably *Rhaphidopalpi* (*Aulacophora*) *femoralis* Motsch., one of the chief pests of cucumbers in Kwangtung, China.

On the structure of some Japanese buprestid larvae, with notes on their life history [trans. title], H. Yuasa (*Jour. Imp. Agr. Expt. Sta., Nisigahara-Machi, Tokyo, Japan, 2 (1933), No. 2, pp. 263–282, pls. 4*).—This account deals briefly with the structure, generic classification, and life history of some buprestid larvae in Japan, namely, *Chrysochroa* (*C.*) *fulgidissima*, *Chalcophora japonica*, *Lampra* sp., *Chrysobothris succedanea*, *Cryptodactylus gracilis*, *Agrilus auriventris*, *A. mali*, and *Trachys subbicornis*.

Catalogue of the phytophagous beetles of China, G. Liu (*Lingnan Sci. Jour., 12 (1933), Nos. 3, pp. 389–408; 4, pp. 473–488*).—This contribution gives keys to families (Bruchidae, Cerambycidae, and Chrysomelidae), subfamilies, tribes, subtribes, and genera of the Phytophaga in China.

Notes on Coccinellidae, with a description of a new subspecies (Coleoptera), J. C. Gaines (*Jour. N.Y. Ent. Soc., 41 (1933), No. 3, pp. 263, 264*).—In this contribution from the Texas Experiment Station a new subspecies of lady beetle, *Hyperaspis fimbriolata marginatus*, collected from weed sweepings at College Station, Tex., is described.

The small elm beetle, Scolytus (Eccoptogaster) multistriatus Marsh., as a disseminator of Dutch elm disease [trans. title], J. J. Fransen (*Tijdschr. Plantenziekten, 38 (1932), No. 9, pp. 197–202, pls. 2, figs. 2*).—A report of studies conducted in continuation of those previously noted (E.S.R., 69, p. 245), in which *S. multistriatus* was found in the Netherlands to have increased in importance in the spreading of *Ceratostomella* (*Graphium*) *ulmi*, the cause of Dutch elm disease. In 1931 *S. scolytus* F. outnumbered *S. multistriatus* 46 to 1, but in 1932 the proportion was 3.3 to 1.

A list is given of 18 references to the literature.

Studies on the peach curculio Rhynchites bacchus L. of south Manchuria [trans. title], H. Y. Arakawa (*Res. Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 12 (1933), pp. 55–78, pls. 2; Eng. abs., pp. 77, 78*).—This is a report of a biological study made of *R. bacchus*, a form second only in importance to the pear curculio *R. heros* Roel. as a weevil enemy of the peach in south Manchuria. The peach curculio is generally distributed from Kinshu to Yugakujo, where it breeds abundantly in wild peach and plum. It attacks plum, prune, peach, apricot, and tomatoes, and is also a serious enemy of wild crab and will attack apples. In unprotected orchards of Yugakujo it often destroys over 70 percent of the crop.

The bionomics of Otiorhynchus cribricollis Gyll., H G. Andrewartha (*Bul. Ent. Res., 24 (1933), No. 3, pp. 373–384, figs. 3*).—This review of the history of the occurrence and of the biology of this weevil enemy of alfalfa, olives, oranges, etc., in Australia and other countries includes a discussion of methods employed in the experiments reported.

"The incubation period of the egg was found to vary between 14 and 37 days. The average was 22.3 days. The habits of the larva are described. Dyar's Law was applied to determine the number of instars, which was found to be 10. The normal duration of larval life is from May to October, or a period of about 5 mos. About 10 percent of the larvae estivate through one summer. These have a larval life of about 17 mo. Normal life of the adult is from November to April, about 5 mo., but some (about 11 percent) hibernate through one winter and thus live 17 mo. The adults feed in two seasonal periods separated by an interval of about 6 weeks, during which time they are inactive. The adults have been observed to feed upon 21 different plants, representing 12 different families. Most of the eggs are laid in the autumn, but a few are laid in the spring. The average number of eggs laid by a weevil under experimental conditions was 50.8. The eggs are probably laid on or under the surface of the soil. The weevils normally reproduce parthenogenetically. No male has been discovered in many hundreds of specimens dissected."

Some Pacific Coast Otiorhynchid weevil larvae, H. H. Keifer (*Ent. Amer., n.ser., 13 (1932), No. 2, pp. 45–85, figs. 52*).—This is a report of a study made of the larvae of the subfamily Otiorhynchinae.

British beetles, their homes and habits, N. H. Joy (*London and New York: Frederick Warne & Co., 1933, pp. XI+143, pls. 31, figs. 21*).—This is a popular account.

The distribution of Sminthurus viridis L. (Collembola) in South Australia, based on rainfall, evaporation, and temperature, J. Davidson (*Aust. Jour. Expt. Biol. and Med. Sci., 11 (1933), No. 2, pp. 59–66, figs. 3*).—The author has found the geographical distribution of *S. viridis* in South Australia to be determined by the mean monthly rainfall and evaporation. When the moisture is favorable, temperature, food plants, soil type, and biotic competition are the important factors affecting increase in numbers of the insect.

A method for obtaining samples of the population of Collembola (Symphypleona) in pastures, J. Davidson and D. C. Swan (*Bul. Ent. Res., 24 (1933), No. 3, pp. 351, 352, fig. 1*).—The authors describe a method and the apparatus devised for use in determining the population of Collembola.

The species of the termite genus Zootermopsis Emerson (=Termopsis Hagen), E. C. Sumner (*Calif. Univ. Pubs. Ent., 6 (1933), No. 7, pp. [3]+197–*

229, pls. 2, figs. 23).—This contribution is presented in connection with a four-page list of references to the literature.

Contribution to a study of the biology of the migratory locust (Locusta migratoria capito Sauss.) in its permanent breeding places [trans. title], B. N. Zolotarevsky (*Min. Agr.* [*France*], *Ann. Épiphyties, 19* (*1933*), *No. 1–2, pp. 47–142, pls. 2, figs. 14*).—An extended account is given of a study made of the biology of this pest in Madagascar, particular attention being given to its phases, presented in connection with a list of 50 references to the literature.

The life-history of a common cockroach, Periplaneta americana Linneus, L. N. Nigam (*Indian Jour. Agr. Sci., 3* (*1933*), *No. 3, pp. 530–543, pls. 4*).—This is a report of a study of the biology of the American cockroach as found under Indian conditions.

The emergence of pear thrips in the Healdsburg area of California in 1932, L. M. Smith (*California Sta. Bul. 562* (*1933*), *pp. 16, figs. 3*).—The ineffective control obtained from work with the pear thrips in the Healdsburg district of Sonoma County, Calif., led to the securing of data through observations of collections from 45 traps devised by the author, which were distributed throughout the district.

The total emergence recorded occurred over a period of 38 days, extending from February 19 until March 27. The peak of emergence and the arithmetical mean occurred on March 9, the normal curve of emergence being distorted by the influence of temperature. A cover crop was found to delay the movement of thrips to the trees after they had emerged from the soil. The number of thrips remaining on the cover crop reached a maximum of 33.2 thrips per square yard on March 2. Irrigation and natural flooding did not appreciably reduce the emergence. Heavy soils showed a much greater emergence than light soils. The average daily emergence per square yard from heavy soils was 21.8, from light soils 3.7. Control measures applied in the spring of 1931 did not produce demonstrable results in 1932.

Two new species of Oedaleothrips, with notes on other species, J. R. Watson (*Fla. Ent., 17* (*1933*), *Nos. 3, pp. 48–50; 4, pp. 63, 64*).—Contributing from the Florida Experiment Station, the author describes *O. walteri* on egg masses of some insect on *Acacia farnesiana* from Buenos Aires, Argentina, and *O. andrei* from a haystack at Boone and Ames, Iowa, as new to science.

Thrips imaginis (Bagnall), L. J. Newman, H. G. Andrewartha, and B. A. O'Connor (*Jour. Dept. Agr. West. Aust., 2. ser., 10* (*1933*), *No. 3, pp. 361–373, figs. 3*).—This is an account of studies of the apple thrips *T. imaginis*, at present the most important pest of deciduous fruits with which growers in Western Australia have to contend. A list of the Thysanoptera collected during the year 1932 is included.

The biological control of the weed Clidemia hirta D. Don. in Fiji, H. W. Simmonds (*Bul. Ent. Res., 24* (*1933*), *No. 3, pp. 345–348*).—The author concludes that eventually a balance will be struck in which sufficient plants of the weed *C. hirta* in Fiji will survive to enable a light infestation of *Liothrips* to maintain itself, any further increase from time to time of the weed leading to an increase in the thrips followed by a decrease in the food plant.

A simple method of collecting thrips and other insects from blossom, J. W. Evans (*Bul. Ent. Res., 24* (*1933*), *No. 3, pp. 349, 350, fig. 1*).—The author describes an apparatus devised while employed in collecting for counts of *Thrips imaginis* Bagn., a pest of deciduous fruit blossom in Australia. It is thought that the device, or an adaptation of it, may prove to be of assistance to other entomologists.

The biology of Podisus serieventris Uhler in Cape Breton, Nova Scotia, M. L. Prebble (*Canad. Jour. Res., 9* (*1933*), *No. 1, pp. 1–30, figs. 17*).—Studies of the biology of *P. serieventris* and its role in an outbreak of the black-headed budworm *Peronea variana* Fern. in Cape Breton, conducted during the years 1930 and 1931, are reported.

There was found to be but one complete generation of this bug during the year. Winter is passed by the adults of both sexes. The eggs are laid in late June, July, and early August, their incubation period ranging between 10 and 15 days. The five nymphal stages require an average of 45 days, thus differing from the life history in Massachusetts, where there have been found to be four nymphal stages and three annual generations. The species was of rather limited value as a control factor in the outbreak described.

A list is given of 24 references to the literature.

Notes on Utah Heteroptera, G. F. Knowlton (*Ent. News, 44 (1933), No. 10, pp. 261–264*).—This contribution from the Utah Experiment Station lists a number of species of true bugs not hitherto recorded from the State and adds to the known distribution of other forms.

Entomological contributions to the study of the sugar-cane froghopper, II, A. Pickles (*Trop. Agr. [Trinidad], 10 (1933), Nos. 9, pp. 240–245; 10, pp. 286–295, figs. 4*).—In this second contribution (E.S.R., 70, p. 63) the influence of host relations and of cultural operations in limiting blight incidence among plant canes is considered.

Transmission of the virus through the eggs of an insect vector, T. Fukushi (*Imp. Acad. [Japan], Proc., 9 (1933), No. 8, pp. 457–460*).—The author reports having found that the virus of dwarf disease of the rice plant may be transmitted through the eggs of the leafhopper carrier *Nephotettix apicalis cincticeps.*

"The majority of the offspring from the infective parents proved to be viruliferous, and the progeny from the crosses between noninfective females and infective males were entirely free from virus whereas those from the crosses between infective females and noninfective males were either viruliferous or free from virus. It appears that the eggs are not affected by the virus after they have been deposited in the leaf sheaths but probably at an early stage of their development in the ovary of the maternal insect body, because in no case has it been observed that the infective progeny emerged out of the eggs from noninfective females which had been laid in the leaf sheaths of diseased plants. It is worthy of note that some individuals of the progeny from the infective females were viruliferous while others from the same parents were apparently free from virus. This appears to indicate that all the ova produced in an ovary are not always affected by the virus."

Some factors involved in aphid transmission of the cucumber-mosaic virus to tobacco, I. A. Hoggan (*Jour. Agr. Res. [U.S.], 47 (1933), No. 9, pp. 689–704, fig. 1*).—In investigations of the influence of various factors on the transmission of the cucumber mosaic virus to tobacco by the green peach aphid conducted cooperatively by the Wisconsin Experiment Station and the U.S.D.A. Bureau of Plant Industry, single aphids were found to cause infection only occasionally, the percentage of infection increasing with the number of aphids used. The virus was transmitted by both winged and wingless viviparous adults and by nymphs of different instars. The adults were found to cause infection after having fed on diseased plants while in the adult stage only. They were able to acquire and transmit the infective principle after very short feeding periods on diseased and healthy plants, respectively, and to complete the entire process in a period of not more than 30 min.

Viruliferous aphids became noninfective after feeding for 2 hr. on a healthy plant and after starvation for from 18 to 27 hr., but remained infective after starvation for from 2 to 3 hr. There was no evidence of any direct transmission of the virus from infective aphids to their progeny.

It is concluded that transmission is, in this instance, a mechanical process, and may be due to a transfer of infectious plant juice on the mouth parts of infective insects.

Physiological products of the lac insect, I, II (*Jour. Indian Inst. Sci., 16A (1933), Nos. 6, pp. 76–83; 9, pp. 97–102*).—In part I, by N. K. Ranga Rao and M. Sreenivasaya, a method for isolating the various fractions from brood lac is described in detail. The nitrogenous constituents have been fractionated into an albumin, precipitable by acetic acid or by salt saturation, and a serum mainly consisting of the simpler polypeptides. The isolation of the insect fat by centrifuging and its subsequent purification are described; the constants point to its being a mixture of a true fat and wax.

Part 2, by Ranga Rao, deals with the water-soluble nitrogenous constituents.

Taxonomic notes on the coffee mealybugs of Kenya Colony, H. C. James (*Bul. Ent. Res., 24 (1933), No. 3, pp. 429–436, pl. 1, fig. 1*).—The notes relate to six species of mealybugs collected from *Coffea arabica* in Kenya, namely, *Pseudococcus lilacinus* Ckll., the citrus mealybug, *P. simulator* n.sp., *P. virgatus* CKll., *P. perniciosus* Newst. & Willc., and the long-tailed mealybug.

Preliminary note on the effect of manuring citrus trees in regard to the development of red scale (Chrysomphalus aurantii), F. S. Bodenheimer and R. Ashbel (*Hadar, 6 (1933), No. 8, pp. 175–178, figs. 2*).—Results thus far obtained from the 2½ years' work indicate that the method of altering fertilization practice is not to be considered as a weapon against the scale. No marked influence was found on the development period of the pest, but it is not yet clear whether the differences in number of offspring per female under different conditions of nutrition are significant.

The biology and control of Asterolecanium coffeae Newst., the fringed scale of coffee, in Kenya Colony, H. C. James (*Bul. Ent. Res., 24 (1933), No. 3, pp. 421–427, figs. 3*).—A report of studies of *A. coffeae*, which occurs in all the British East African dependencies and has been the cause of much loss in certain low-lying coffee areas of Kenya. Its parasites and predators are noted.

The natural control of the cabbage caterpillars, Pieris spp., J. E. Moss (*Jour. Anim. Ecol., 2 (1933), No. 2, pp. 210–231, figs. 2*).—The imported cabbage worm, accidentally introduced into New Zealand in 1930, is now increasing in numbers and spreading rapidly. In the present contribution the author reports upon the methods used by agents of that Government in the collection and introduction of its parasites, together with observations on their biology and interrelation. The account is presented in connection with a list of 20 references to the literature.

Artificial parthenogenesis of the silkworm [trans. title], **N. K. Kol'tsov** (*Priroda, 22 (1933), No. 5–6, pp. 85–93*).—In experiments conducted a 30° C. solution of alcohol induced parthenogenesis, as did hydrogen dioxide, iron chloride, silver nitrate, and a series of other reagents. The morphological characteristics of the developing eggs are described.

Notes on the biology of certain tortricid species, with structural details of the larvae and pupae, J. McDunnough (*Canad. Jour. Res., 9 (1933), No. 5, pp. 502–517, figs. 9*).—Notes are here given on the biology of 6 species of Tortricidae, namely, *Sparganothis* (*Cenopis*) *directana* Walk., *Tortrix alleniana* Fern., *Cacoecia myricana* McD., *C. parallela* Rob., *Tortricodes horariana* Wlshm., and *Peronea cornana* McD.; 3 species of Eucosminae, namely, *Epinotia lindana* Fern., *E. myricana* McD., and *Anchylopera semiovana* Zell.; and 5 of Argyroplocinae (Oleuthreutinae), namely, *Exartema cornanum* Heinr., the raspberry leaf roller, *E. valdanum* McD., *Argyroploce albiciliana* Fern., and *Evora hemidesma* Zell.

The duration of Eulan protection against the webbing clothes moth, III [trans. title], A. Hase (*Anz. Schädlingsk., 9 (1933), No. 7, pp. 85–92, figs. 7*).—This third contribution (E.S.R., 69, p. 833) reports upon a series of experiments conducted with a view to determining the lasting efficiency of Eulan products, including Eulan NK, Eulan W Extra, and Eulan Neu.

The development of Entomophthora sphaerosperma upon Rhopobota vacciniana, W. H. Sawyer (*Ann. Bot. [London], 47 (1933), No. 188, pp. 799–809, pls. 3, fig. 1*).—An account is given of a study made of the widely distributed and important entomophthorous fungus *E. sphaerosperma*, found by the author on the larvae of the lepidopteran *R. vacciniana* (the black-headed fireworm), an important enemy of the cultivated cranberry. The host shows evidence of infection only after the disease has become well established throughout its body. The first symptoms are change from a green to a yellowish color and restless movements. These symptoms are followed by sluggishness and increased turgor. Death is deferred until near the end of vegetative development of the fungus, when the animal's tissues are much disintegrated and its body is soft and flaccid. The average time necessary for the fungus to complete its cycle, from inoculation to conidial production, is about 72 hours.

Observations on Aëdes aegypti L. (Dipt. Culic.) under controlled atmospheric conditions, D. J. Lewis (*Bul. Ent. Res., 24 (1933), No. 3, pp. 363–372, figs. 5*).—The methods employed in rearing and manipulating the yellow-fever mosquito are described. Longevity experiments were carried out with 534 mosquitoes under 11 sets of conditions of atmospheric temperature and humidity. Also, 379 females were given an opportunity to suck blood. The following conclusions were reached:

"The length of life of starved mosquitoes at 23° C. is very much dependent on humidity, but it cannot be directly related to saturation deficiency. In these experiments there is no significant difference between the mean survivals of males and females, the former being generally longer. The survival periods of fed and unfed females have a similar relation to humidity, the fed ones surviving the conditions for a longer period irrespective of the date of feeding. The effect of a change of temperature of 7° on the survival at 23° and 30° is much less than would be expected when the long survival period at 10° is considered. In the absence of any efficient physiological adaptation for retarding loss of water, the females, possibly for this reason, seek a blood meal mainly in saturated air at the temperature of maximum activity."

The effects of freezing on the larvae of Aedes aegypti, A. R. Bliss, Jr., and J. M. Gill (*Amer. Jour. Trop. Med., 13 (1933), No. 6, pp. 583–588*).—The authors' studies in Tennessee have shown that the larvae of the yellow-fever mosquito will revive after having been encrusted in ice for periods of not longer than 10 hours, and will proceed to maturity about as rapidly as other larvae. If encrusted in ice for 11 or more hours the larvae of this genus are killed. Consequently it is probable that larvae of the yellow-fever mosquito which are overtaken by freezing temperatures and frozen solid for 11 or more hours do not survive the winter months, although larvae which submerge may possibly hibernate. The eggs of this species are seemingly more resistant to freezing than are the larvae. In cold climates, if the larvae of the yellow-fever mosquito are frozen solid during the winter months survival of the species is dependent upon the eggs or the hibernating females, or both.

Yellow fever without Aedes aegypti: Study of a rural epidemic in the Valle do Chanaan, Espirito Santo, Brazil, 1932, F. L. Soper, H. Penna,

E. CARDOSO, J. SERAFIM, JR., M. FROBISHER, JR., and J. PINHEIRO (*Amer. Jour. Hyg., 18 (1933), No. 3, pp. 555–587, pl. 1, figs. 3*).—Field studies in the Valle do Chanaan, Espirito Santo, Brazil, showed that yellow fever was widespread during at least 3 mo. in a strictly rural section in which the yellow-fever mosquito was not found, even after a thorough and prolonged search begun 6 weeks before the apparently spontaneous disappearance of the disease from the district.

"Of the species of mosquito incriminated by laboratory experiments as potential vectors of the yellow fever virus, only *A.* (*Ochlerotatus*) *scapularis* Rond. and *A.* (*Taeniorhynchus*) *fluviatilis* Lutz exist throughout the infected area in sufficient numbers to merit consideration as being possibly responsible for the epidemic. Of these, *A. scapularis* was found much more frequently, both as larva and as adult, and is believed to be the more dangerous species."

Housing and malaria: A critical summary of the literature dealing with this subject, C. LANE (*Genève (Geneva): League of Nations, Health Organ., 1931, pp. 43, figs. 4*).—A digest of the literature relating to housing and malaria, together with a list of 87 references.

The common house fly as other than a simple mechanical carrier of avian coccidia, J. P. DELAPLANE and H. O. STUART (*Poultry Sci., 12 (1933), No. 6, pp. 390, 391*).—An experiment conducted at the Rhode Island Experiment Station and here reported is considered to indicate that "oocysts are destroyed or eliminated in the process of development of the larvae into the adult fly, and thus the common house fly is only a potential mechanical carrier of the organism."

Differential behaviour of Lucilia sericata Meig. and Lucilia caesar L. in natural environments, F. G. HOLDAWAY (*Jour. Anim. Ecol., 2 (1933), No. 2, pp. 263–265*).—Trap records here reported show *L. sericata* to frequent open habitats and *L. caesar* shady habitats. A comparison of records from traps in open situations with records of nebulosity and temperature suggests that the range of waves of radiant energy favoring activity of *L. sericata* is higher than that favoring activity of *L. caesar.*

Observations on the life-histories, nutritional requirements, and fecundity of blowflies, M. J. MACKERRAS (*Bul. Ent. Res., 24 (1933), No. 3, pp. 353–362*).—In the course of the work reported five species of blowflies, namely, *Lucilia sericata* Meig., *L. cuprina* Wied., *Chrysomyia rufifacies* Macq., *Calliphora stygia* Fab., and *C. augur* Fab., were reared through many generations in captivity. These flies were bred in artificial light as well as in sunlight. Inbreeding had no effect upon activity, fecundity, or length of life.

"A diet of protein is necessary for the maturation of ova but not of spermatozoa. Oviposition is not strictly associated with a suitable larval environment, but is more in the nature of a response to a tactile stimulus. Copulation appears to provide an essential stimulus for oviposition. No evidence of parthenogenesis has been obtained, and unfertilized females did not lay eggs. The maximum oviposition observed was 3,171 ova by a hybrid *Lucilia.* This fly lived 94 days. A total oviposition of 2,373 ova was observed in a *L. sericata.* Both parent flies lived 77 days. The number of ova a fly can produce at one time is dependent on its size and thus on the amount of food obtained in the larval stage. The sex ratio for *Lucilia* is very close to 1:1. Starvation in the larval period did not have a marked effect on the sex ratio."

It is possible to cross the two closely related species of *Lucilia*, and the *L. cuprina* characters appear to be dominant. It is unlikely that this cross occurs in the field.

A list is given of 25 references to the literature.

The virus of rinderpest and its relation to Glossina morsitans Westw., J. Carmichael (*Bul. Ent. Res., 24 (1933), No. 3, pp. 337–342*).—The author has been unable to obtain any evidence that rinderpest virus, as it exists in the peripheral blood of infected animals, in any way affects *G. morsitans*, either directly or from the point of view of reproduction.

Investigations of the life history and combat of the cherry fruit fly Rhagoletis cerasi L., I [trans. title], R. Wiesmann (*Landw. Jahrb. Schweiz, 47 (1933), No. 7, pp. 711–760, figs. 27; Fr. abs., pp. 756–758*).—An account of the several stages of this cherry fruit fly, its biology and control measures, together with a list of 46 references to the literature.

The results of further experiments with attrahents for the olive fruit fly conducted in the commune of Pisciotta (Selerno) in 1931 [trans. title], G. Bua (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 5 (1932), pp. 63–71; abs. in Rev. Appl. Ent., 20 (1932), Ser. A, No. 7, p. 383*).—In continuation of earlier experiments by Ricchello with the olive fruit fly (E.S.R., 68, p. 504), new formulas were tested. The best results were obtained from the use of a commercial preparation known as "Dachicida F. 1931", which contained 2.2 parts by weight of water, 1.8 of ammonium fluoride, and 96 of the normal stock bait solution (95 gal. of beet molasses, 25 lb. of sodium arsenite, and from 2.5 to 3 gal. of water). This is a modification of the preparation found to be the best in 1930 (Dachicida F.). It was also used at 10 percent strength. The presence of the ammonium fluoride appears to be the cause of the greater attractiveness of the bait, the quality of the molasses not being involved.

Apiculture, II [trans. title], E. Zander (*Flugschr. Deut. Gesell. Angew. Ent., No. 6, 4. rev. ed. (1933), pp. 45, figs. 36*).—A fourth revised edition of this part (E.S.R., 51, p. 555).

The "buckwheat problem" and the behavior of the honey-bee, F. E. Lutz (*Amer. Mus. Novitates, No. 688 (1934), pp. 10*).—The author reports upon studies of the behavior of the honeybee as related to its power to associate the presence of food with its availability at a certain time or times of the day.

The treatment of American foulbrood, J. I. Hambleton (*U.S. Dept. Agr., Farmers' Bul. 1713 (1933), pp. II+14, figs. 6*).—This account supersedes that given in Farmers' Bulletin 1084 (E.S.R., 42, p. 859).

A study in the relative constancy of hive bees and wild bees in pollen gathering, W. H. Brittain and D. E. Newton (*Canad. Jour. Res., 9 (1933), No. 4, pp. 334–349*).—This is a report upon an investigation undertaken primarily to determine the relative pollen constancy of hive bees and wild bees to apple bloom and, secondarily, to various spring and summer blooming plants, the work being conducted at Macdonald College, Que., and at various stations in Kings County, N.S. In addition to hive bees, the insect pollinators included solitary bees of the genera *Halictus* and *Andrena*, with bumblebees and various Diptera playing a minor role.

"It is pointed out that apparent flower constancy depends a great deal upon availability, and that almost any result may be obtained by choosing certain periods in which to make tests. The results, based on analyses of the pollen loads of bees captured in apple blossoms, place the hive bees first as regards the number of pure loads, followed by *Halictus*, with *Andrena* a poor third. Taking into consideration the results of the entire season, and the analyses of bees from different sources of pollen, *Halictus* came first in these particular tests, but the difference is not considered significant. The supposed superiority of the hive bee from the standpoint of constancy does not appear to have been proved. Both *Halictus* and the hive bee, however, evidenced a significant superiority over the *Andrena* species studied."

Melliferous significance of essential oil plants [trans. title], V. I. Chirkov (In *Éfirnomaslichnye Rasteniia ikh Kul'tura i Éfirnye Masla* (*Essential oil plants, their cultivation and essential oils*, edited by E. V. Wulff). *Leningrad: Lenin Acad. Agr. Sci., Inst. Plant Indus., 1933, vol. 1, gen. pt., pp. 174–178*).—The author discusses the relation between the oil-bearing plants and the capacity of definite areas of such plants for a bee population. He presents data on the number of blooms produced by a series of oil-bearing plants, the relation of that to the bee population, and the type of honey produced.

Studies on the Apoidea of western Nova Scotia, with special reference to visitors to apple bloom, C. E. Atwood (*Canad. Jour. Res., 9 (1933), No. 5, pp. 443–457*).—This is a report of studies of the wild bees of Nova Scotia carried out in connection with apple pollination investigations in the Annapolis-Cornwallis Valley. The literature relating to the biology of Apoidea is reviewed, and a list is given of the bees taken on apple bloom. Members of the genera *Halictus* and *Andrena* having been found to be the most important native pollinators, the paper deals in a large part with the life history and habits of representative species.

A biological study of a chalcid: Mormoniella vitripennis Walk. [trans. title], G. Cousin (*Bul. Biol. France et Belg., 67 (1933), No. 3, pp. 371–400, figs. 8*).—This report of the author's studies of a pteromalid parasite of the pupae of muscids is presented in connection with a three-page list of references to the literature.

Biological control of insect pests and the possibility of utilising Trichogramma minutum Riley in India for the control of sugarcane borers, E. S. Narayanan (*Agr. and Livestock in India, 3 (1933), No. 5, pp. 459–464*).—A brief review of the literature presented in connection with a list of 10 references.

Comparative observations on the morphology and biology of some hymenopterous parasites of carrion-infesting Diptera, A. C. Evans (*Bul. Ent. Res., 24 (1933), No. 3, pp. 385–405, figs. 12*).—In this contribution the biology and larval morphology of three alysiine braconids and one chalcid, parasites of the preimaginal stages of some carrion-infesting dipterous larvae, are described. The mode of hibernation of the parasites is recorded. The oviposition of *Alysia manducator* Panz. and *Aphaereta minuta* Nees is discussed in detail, attention being drawn to the hitherto neglected sense organs located in the tarsi of these two species and to their importance in the process of oviposition. The differing responses of full grown *Lucilia sericata* Meig. larvae to parasitism by *A. manducator* at high and low temperatures are suggested to be due to differences in the physiological states of the host larvae at these temperatures. A comparative study of the three endoparasitic alysiines suggests that *A. manducator* may have reached a state of endoparasitic life relatively later than the other species studied, or at least has not yet reached such an advanced stage of endoparasitic specialization as have *A. minuta* and *Aspilota nervosa* Hal. The growth of the egg in *A. minuta* and *A. manducator* and of the larvae of *Mormoniella vitripennis* Walk. is discussed.

A list is given of 22 references to the literature.

The cytology of parthenogenesis in Tenthredinidae, A. R. Sanderson (*St. Andrews Univ. [Dundee, Scot.] Pub. 33 (1933), pp. 321–451, pls. 19, figs. 8*).—Following an introduction and a historical review the author deals with the biology of the imported currant worm, including material and methods, cytological observations, parthenogenesis in Hymenoptera, etc. This sawfly is arrhenotokously parthenogenetic, the male arising from an unfertilized egg. A six-page list of references to the literature is included.

The cyclamen mite and the broad mite and their control, F. F. Smith (*U.S. Dept. Agr. Circ. 301 (1933), pp. 14, figs. 7*).—Studies of two important mites which occur simultaneously on many greenhouse crops, extending over a period of 2 yr., are reported upon. Both the cyclamen mite and the broad mite, which latter may prove to be synonymous with *Tarsonemus translucens* Green, severely injure cyclamen plants but in different ways, the former by distorting leaves and flowers, the latter by causing crinkling of leaves and stunting of growth. They both live the entire year on the plants and spread naturally to adjacent plants where foliage touches. They are also distributed when infested foliage is brushed against uninfested plants and even by the hands of those working with the plants.

It has been found that "the broad mite may be most readily controlled by carefully dusting plants with finely divided sulfur or diatomaceous earth, or by repeated fumigations with naphthalene or calcium cyanide. The cyclamen mite is less readily controlled by the same dusts or fumigants that are effective against the broad mite, not only because the former is protected in crevices or distorted leaves, but because it is more resistant to some of the treatments. Experiments have shown that both mites are killed when the infested plants are immersed for 15 min. in water heated to 110° F., except that for those in the crowns below the soil surface a 25-min. treatment is required. Vapor-heat treatment for 30 min. at 110° kills the mites as effectively as the 15-min. dip. The major crops attacked by the cyclamen mite are not injured or are very slightly injured by the heat treatments. The treatment will therefore be of value to florists where other methods have failed, but particularly on cyclamens and other potted plants."

The cattle tick: Its biology and control, F. C. Bishopp (*Ohio State Univ., Abs. Doctors' Diss., No. 9 (1932), pp. 17–28*).—This contribution includes a table which summarizes the preoviposition, incubation, and larval longevity of the cattle tick, based on groups of ticks collected at weekly intervals at Dallas, Tex.

Observations on the host selection of Ornithodorus talaje Guern. in Panama, L. H. Dunn (*Amer. Jour. Trop. Med., 13 (1933), No. 5, pp. 475–483*).—Studies conducted by the author during a period of three years in Panama have shown that *O. talaje* may select human, mammalian, avian, and reptilian hosts on which to engorge.

The survival of yellow fever virus in ticks, N. C. Davis (*Amer. Jour. Trop. Med., 13 (1933), No. 6, pp. 547–554*).—Studies conducted at the yellow fever laboratory of the Rockefeller Foundation at Bahia, Brazil, have shown that yellow fever virus may remain alive in ticks for considerable periods, its persistence having been demonstrated by the injection of tick suspensions into *Macacus rhesus* monkeys.

It was found that fatal yellow fever was caused by adult fowl ticks injected into monkeys 6 days after the infective blood meal; adult *Amblyomma cajennense* Fab. injected 15 days after the infective blood meal (although injection of ticks from the same lot after 28 days gave rise to immunity without clinical indications of disease); adult brown dog ticks injected 23 days after the infective blood meal; injection of brown dog tick nymphs 10 days after the infective feeding; larvae of *Boophilus microplus* (Canestr.) injected 10 days after the infective blood meal; and chicken mites (genus and species not determined) injected 6 days after the infective blood meal.

"In a limited number of experiments no evidence was secured that yellow fever virus was passed from one generation of tick to another through the egg, that virus persisted through the transformation of larva to nymph, or that virus was transmitted by the bites of infected ticks at any stage of life."

The details of the study are presented in tabular form.

Transmission of yellow fever by ticks [trans. title], H. de Beaurepaire Aragao (*Compt. Rend. Soc. Biol.* [*Paris*], *114* (*1933*), *No. 29, pp. 137–139*).—The author's experiments in Brazil here reported indicate that the virus of yellow fever may remain viable in the body of the tick *Amblyomma cajennense* Fab. for as long as 14 days and be transmitted through the bite of this tick. The virus was recovered from the eggs at least 11 days after their oviposition by a tick which had engorged on an infected animal some 25 days before.

ANIMAL PRODUCTION

Animal investigations [at the Colorado Station] (*Colorado Sta. Rpt. 1933, p. 8*).—Preliminary information obtained is reported on a comparison of protein supplements in beet byproduct rations for fattening calves, a comparison of grains for fattening calves, and hog millet v. corn for fattening lambs.

[Livestock investigations in Illinois] (*Illinois Sta. Rpt. 1933, pp. 66–74, 77, 78, 79–94, 95–98, 112–117, figs. 3*).—The beef cattle studies report information on the influence of various rotations on the amount of beef, pork, and mutton produced from a given area, by H. P. Rusk and W. L. Burlison; new pastures as a help in maintaining beef cows at low cost, ear corn silage v. shelled corn for beef calves, objections to soybean hay for beef cattle, and influence of the processing method on soy oil meal unpalatable, by Rusk and R. R. Snapp; development of permanent pasture within one year's time, by Rusk; and comparative quality of yearling and baby beef, by H. H. Mitchell, T. S. Hamilton, and S. Bull.

In tests with swine, information is obtained on cheapening the cost of producing pork by alfalfa pasture, hulled oats v. corn for fattening hogs, and wider utilization of oats by brood sows, by W. E. Carroll and W. P. Garrigus; soybean oil meal protein for fattening pigs, by Carroll, Garrigus, Mitchell, and Hamilton; the "intermediate" hog as most nearly meeting packer demand, by Bull and Carroll; the difficulty in getting firm pork from light lard-type hog, by Bull; the curing and prevention of milk anemia by iron salts alone, by Mitchell and Hamilton; the ineffectiveness of selection in producing rapid-gaining pigs, by Carroll and E. Roberts; and the decreased palatability of diseased grain.

Data obtained in studies with sheep are reported on alfalfa pasture for lamb feeding, and feeding ewes soybean hay and silage, by W. G. Kammlade.

In poultry studies, data are obtained on tracing the effects of vitamin E deficiencies on poultry, by L. E. Card, Mitchell, Hamilton, and F. B. Adamstone; value of different soybean oil meals for chicks, by H. J. Sloan and Card; need of accurate feeding standards in the turkey industry, by Card, Mitchell, and Hamilton; and a system devised for predicting an animal's protein needs, by D. B. Smuts and Mitchell.

An evaluation of Canadian feeds on the basis of digestible nutrients, J. G. Stothart (*Sci. Agr., 13* (*1933*), *No. 10, pp. 653–658; Fr. abs., p. 669*).—A modification of the plan suggested by Petersen (E.S.R., 68, p. 806) for evaluating feeds, in which the digestible crude protein and total digestible nutrients are both used as a basis of evaluation, is discussed in this paper from the Central Experimental Farm, Canada. The constants and relative valuations for the more common livestock feeds and the adaptation of the method to Canadian feeding practice are presented.

Chemical composition of herbage from Massachusetts pastures, J. G. Archibald and E. Bennett (*Massachusetts Sta. Bul. 300* (*1933*), *pp. 7*).—During the course of a survey of Massachusetts pastures from the standpoint of chemical composition, approximately 100 samples of herbage from representative natural upland pastures were collected from different sections in the five western counties of the State. In addition to the analyses of the grasses, samples of surface soil from some pastures were tested for acidity and available phosphorus content.

It was found that in general the moisture, protein, and phosphorus of grasses decreased from spring to autumn, while the fiber and calcium content increased. There was a very definite relation between the moisture content and the protein and phosphorus content of the grass. The soils had a pH range of from 5.1 to 6, with most of them being above 5.5. In general, these soils were low in available phosphorus. It was concluded that the most important single factor in pasture management was the moisture supply. A poor quality of herbage was usually linked with scanty grazing.

An industrial alcohol by-product stock food (*Maryland Sta. Bul. 349* (*1933*), *pp. 545–560, figs. 3*).—This investigation was undertaken to determine the value of a byproduct obtained in the manufacture of alcohol from cane-molasses as a feed for animals, and was divided into two parts. This byproduct is described as a dark brown, finely ground meal, analyzing 7.43 percent moisture, 5.02 percent nitrogen, 3.47 percent fat, 9.25 percent fiber, 36.55 percent nitrogen-free extract, and 11.93 percent ash.

I. *Nutrition and vitamin tests*, L. B. Broughton and P. W. Frey.—Tests with white rats were designed to estimate the availability of the nitrogen as protein and the vitamin content of the material. When fed as the only source of protein in a diet, the results were negative. In some cases the weight of the animals was maintained at the same level for from 2 to 5 weeks, but no steady growths were recorded and the appearance of the animals was poor. While this food was not palatable to rats, no toxic effects were observed even on the high protein level. As a protein supplement this feed was satisfactory when the amounts fed were not high enough to affect the palatability of the ration. The amount of vitamin B in this feed was found to be very high.

II. *Alcohol by-product as a supplement for corn in rations for fattening hogs*, B. E. Carmichael.—When fed to hogs, the byproduct feed had a definite laxative effect when used to supplement corn and minerals with or without fish meal. Considerable variation was found in the palatability of the feed in three tests when fed with either corn or corn and fish meal. These results indicated that the palatability might be influenced by the manufacturing process. Fish meal contained twice as much protein as the byproduct, and as a single supplement to corn it proved to be less valuable than fish meal. The results indicated that for its efficient use the byproduct should be mixed with ground corn. When both the byproduct and fish meal were included in the ration, the consumption of minerals was reduced.

Commercial feeding stuffs, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 366* (*1933*), *pp. 47*).—The usual report of the analyses for protein, fat, and fiber of 2,052 samples of feeding stuffs collected for official inspection during April 1933 (E.S.R., 69, p. 841).

Vitamin-A deficiency as related to reproduction in range cattle, G. H. Hart and H. R. Guilbert (*California Sta. Bul. 560* (*1933*), *pp. 30, figs. 5*).—An outbreak of vitamin A deficiency in cattle under natural conditions was diagnosed and its various manifestations in animals of different ages studied. The conditions that brought about this deficiency were environmental in nature, namely, a prolonged dry-feed season during which the feed consisted mainly of grazing on ripened wheat, wheat and barley stubble, straw mixed with wheat and barley hay, barley grain, and whole cottonseed. The symptoms most commonly manifested were (1) birth of dead or weak calves with or without eye lesions and associated with retained placenta, (2) severe diarrhea in weak new-born calves, and (3) eye lesions, particularly in immature animals.

It is pointed out that these conditions are more severe in animals when the diet is otherwise complete and supplied in amounts above maintenance. Under the multiple deficiencies of the range the abnormalities are commonly limited to reproductive failures. A review is presented of the data on the nature and occurrence of vitamin A and on the relation of this vitamin to reproduction. It is pointed out that the best practical source of this vitamin for livestock is green feed or hay, and that the vitamin A potency of hay is associated with the degree of green color.

Because many of the symptoms of vitamin A deficiency may be easily confused with other disorders of cattle, a section of the bulletin has been devoted to differential diagnosis.

Comparison of grain rations for beef calves before and after weaning, W. H. Black and E. A. Trowbridge (*U.S. Dept. Agr., Tech. Bul. 397* (*1933*), *pp. 16*).—Continuing the work at the Sni-a-Bar Farms, Mo. (E.S.R., 64, p. 253), this experiment was undertaken to compare the following grain rations for feeding calves from the time they were old enough to eat until weaning time and for fattening them in dry lot: (1) Shelled corn, (2) shelled corn and cottonseed cake 8:1, and (3) shelled corn and oats 2:1. For roughage alfalfa hay and corn silage were fed. The experiment covered a period of 3 years.

During a period of 140 days, ration 2 produced 7.5 percent greater gain than ration 1 and 8.7 percent more gain than ration 3. During the nursing period the calves on ration 1 gained 100 lb. in live weight for each 177 lb. of grain fed, while rations 2 and 3 required 199 and 251 lb. of grain, respectively, for the same gain. At weaning time the calves fed ration 2 were appraised at 50 ct. per 100 lb. more than the calves fed either of the other rations. Heifer calves fed corn and cottonseed cake in creeps gained about 4 percent less than steers similarly fed, but were appraised at weaning time at the same price. Heifers consumed about 24 percent more grain per unit of gain than steers. Adding oats to a corn ration increased the grain consumed per unit of gain without increasing the rate of gain or value of animals. Adding cottonseed cake increased the degree of finish and also the appraised value.

In the dry lot fattening tests of 196 days each immediately following weaning, there was no significant difference in the total gains made on any of the rations. During this period calves fed corn alone required slightly less feed per unit of gain than those receiving corn and cottonseed cake. Adding oats to the corn ration during this period increased the sales value of the animals slightly, but had little effect on the rate or economy of gains. A 1-yr. test with heifers fed corn and cottonseed cake indicated that they gained at approximately the same rate as steers, but required more feed per unit of gain and their sales value was lower.

Use of skimmilk powder, blood flour, and fish meal in grain rations for calves, M. H. Berry (*Maryland Sta. Bul. 354* (*1933*), *pp. 121–143, figs. 9*).—The information reported in this bulletin is divided into four parts, the first of which has been previously noted (E.S.R., 68, p. 807).

In the second phase, two groups of 10 calves each were fed the same ration except that in one case the animals received dried blood flour and in the other fish meal as part of the feed mixture. No appreciable difference was found between the two feeds on the basis of growth produced by the calves. The dried blood flour cost approximately twice as much as the fish meal. Throughout the test and at the end of the trial the calves fed fish meal were far superior to those fed dried blood flour in general appearance and finish.

After obtaining the results in the above phases, a group of 10 calves was fed a ration containing a combination of dried blood flour, fish meal, and skim milk powder. The rate of growth, feed cost, and general appearance of this group of calves were very unsatisfactory.

In the fourth phase, two groups of five bull calves each were weaned at 30 days of age and placed on a dried grain mixture containing either dried blood flour or skim milk powder. Throughout the entire trial both lots were in a thin, rough, and unthrifty condition. They had a stunted appearance and did not approach in size, growth, or vigor other calves that were not weaned until eight weeks of age.

Corn-and-cob meal versus shelled corn for fattening calves, P. Gerlaugh and H. W. Rogers (*Ohio Sta. Bimo. Bul. 165 (1933), pp. 143, 144*).—To determine the effect of the method of preparation on the relative value of a bushel of ear corn, two lots of steer calves were fed at the Madison County Experiment Farm from November 23 to August 17. In addition to corn-and-cob meal fed in lot 1 and shelled corn fed in lot 2, both groups received approximately the same amount of protein supplement and hay. The average weight per head was 376 lb. at the beginning of the test, and the average daily gains in the respective lots were 2.2 and 2 lb. per head. The cost per 100 lb. of gain was 50 ct. less in lot 1 than in lot 2. The returns per bushel of corn where no processing charges were made were 65 and 57 ct. in the respective lots. A severe attack of shipping fever at the start of the experiment made the results of the test somewhat inaccurate.

The breeding of coloured sheep, J. A. Fraser Roberts (*Scot. Jour. Agr., 16 (1933), No. 2, pp. 184–191*).—In this article the author describes the inheritance of the important colors in wool and explains how a colored flock may be built up rapidly. The advantages and disadvantages associated with the production of undyed fabrics are discussed.

The uses of oats and oat products in pig feeding (*Scot. Jour. Agr., 16 (1933), No. 3, pp. 335–339*).—Tests by A. H. Blissett at the Rowett Research Institute, Scotland, showed that oats made a suitable feed for pigs in any form except oatdust. Crushed oats were satisfactory for fattening young pigs when fed at a 30 percent level to pigs under 100 lb. live weight, and the level could be increased to 70 perecnt for pigs over 100 lb. Sussex ground oats produced good gains when fed at a 70 percent level to pigs under 100 lb. in weight, but the cost of gains was high. Dehusked oats and oatmeal were not superior to crushed oats when forming one third of the total ration and were more expensive

"Seedy cut" as affecting bacon production, L. J. Cole, J. S. Park, and A. Deakin (*Wisconsin Sta. Res. Bul. 118 (1933), pp. 61, pl. 1, figs. 18*).—This study was undertaken in an effort to discover the cause and to develop methods for the control of seedy cuts. The principal types of seed are (1) pigment seed—discoloration of the mammary gland, due to pigment granules derived from the skin, usually black, and (2) vascular seed—discoloration of the mammary gland, due to vascular hypertrophy, causing hyperemia, and frequently accompanied by extravasation of blood into the tissues; it may be red, pink, or white.

The percentage of trim for black seed averaged 16 percent of the square-cut belly, but depended on the color and extent of the vascular seed associated with it. This type of seed was due to a dipping-in process of the pigment-bearing cells of the skin during the growth of the gland in early fetal life. Black seeds were larger in gilts than in barrows, due to the undeveloped condition of the mammary glands in the latter, and the same was true of spayed gilts.

Pigment seed was black in both black and red hogs and tended to disappear with lactation and possibly with the recurrence of heat periods. Vascular seed began to appear when a gilt reached sexual maturity and changed in color from red following oestrum through pink to white in dioestrum. With succeeding cycles there was more seed and a greater amount of connective tissue. During pregnancy the seed was red, but following lactation it lost its color and became flabby and tough.

Black seed occurred in about 50 percent of the gilts of black breeds, 23 percent of gilts of black and white breeds, 20 percent in red breeds, and not at all in white breeds. It was found in from 6 to 8 percent of the barrows of black and black and white breeds and not at all in red or white breeds. All barrows were free of vascular seed. In nonpregnant mature gilts red seed were found in about 25 percent, white seed in 50 percent, and intermediate or pink in the remainder. Using the square-cut belly as a base, it was found that about 8 percent was lost in trimming clear bellies of immature gilts, 12.5 for white seed, 18 percent for pink seed, and 21 percent for red seed. About 20 percent was lost for red seed in the trim of bellies of pregnant gilts. During the oestrus cycle the loss was over 13 percent just before oestrum, 21 percent in metoestrum, and 12.5 percent in dioestrum. The percentage of trim increased roughly with the size of the belly. Spaying gilts stopped sexual development and eliminated the necessity for trimming for vascular seed and also reduced black seed greatly.

The most effective control measure appeared to be the production of white hogs for bacon purposes, thus eliminating black seed, and the spaying of all gilts intended for market, thus preventing loss from vascular seed and eliminating the necessity of an exploratory trim. The use of white boars on sows of dark-colored breeds has been resorted to in certain sections as a means of producing white market hogs.

Grain and skimmilk versus grain and mash for egg production, O. S. WILLHAM (*[Oklahoma] Panhandle Sta., Panhandle Bul. 52 (1933), pp. 3–10*).—Continuing previous investigations (E.S.R., 68, p. 658), four lots of 25 pullets each were fed for one year. Three of the lots were fed as in the previous test, while the fourth lot received a ration made up largely of home-grown feeds with half the meat scrap left out and with skim milk kept before the birds at all times.

The pen fed grain and skim milk produced about 7.5 percent more eggs and had a margin over feed cost of about 26 ct. per bird more than any of the other pens. Feed cost per dozen eggs ranged from 4.42 ct. in the pen receiving grain and skim milk to 7.33 ct. in the pen receiving the station laying mash. The grain and skim milk pen did not react to changes in weather so much as the other pens. There was no significant difference in the production in the pens receiving mash. The mortality ran high and there was evidence of internal parasites in all pens. Because of the abmormal weather conditions under which the test was conducted, such as cold, dust storms, and drought, it is stated that too much confidence should not be placed in the results.

Effect of milk products on pH of intestinal contents of domestic fowl, D. W. ASHCRAFT (*Poultry Sci., 12 (1933), No. 5, pp. 292–298*).—A series of studies was carried out at the Ohio Experiment Station to determine the effect of diets containing various amounts of milk products on the pH concentration of the contents of the intestinal tract of the adult domestic fowl. The basal diet contained 20 percent of meat scrap, and the experimental diets 20, 40, 28, 40, and 20 percent, respectively, of dried buttermilk, dried buttermilk, Kraco (a dried whey), dried skim milk, and lactose. The experimental procedure consisted of diluting the contents 1:4, comminuting, centrifuging, and testing the supernatant fluid by electrometric methods.

The pH of the duodenum and ileum content was increased, while that of the cecal content was markedly decreased, by use of milk products. Feeding these products changed the cecal contents from a characteristic firm, brownish, pultaceous mass to a yellow, creamy, frothy mass, and the cecal horns were distended two to three times normal size. A decrease in the pH of the contents of the large intestines was noted, particularly with the rations containing Kraco, dried skim milk, and lactose. On the basis of their ability to lower the pH of the ceca and the large intestine contents, the experimental rations ranked as follows: 6, 5, 4, 3, 2, respectively. Birds fed Kraco showed a persistent diarrhea and loss of weight, and the dried skim milk and buttermilk diets produced slight diarrhea.

Better rations, more eggs, greater profits, W. C. TULLY (*South Dakota Sta. Circ. 14* (*1933*), *pp. 16, figs. 9*).—The reasons for feeding poultry, the use and necessity of the various nutrients in feeds, balancing rations, feeding methods and rations, and artificial lights for layers are discussed in this publication.

Characteristics of non-broody and intense broody lines of Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul. 301* (*1933*), *pp. 12*).—Continuing these studies (E.S.R., 69, p. 96), two lines of Rhode Island Reds bred for nonbroodiness, respectively, were carried for a period of nine years to study the nature of the broody instinct and its relation to fecundity.

The two lines proved to be practically the same in age at sexual maturity, winter clutch size, and annual persistency. The nonbroody line had a shorter winter pause and had more families free from pause than the broody line. During the experiment the mean percentage of nonbroody daughters was 72.7 in the nonbroody line and 20.5 in the broody line. Dams that were free from broodiness for three or more years produced significantly greater numbers of nonbroody daughters than did dams that were free from broodiness only one or two years. Broodiness could not be entirely eliminated by the selection of aged broody-free dams.

The nonbroody line had 2.63±0.16 broody periods and the broody line 3.99±0.11 broody periods during the experiment. The fact that daughters showed a definite and consistent increase in degree of broodiness as the number of broody periods of their dams increased proved that the degree of broodiness was inherited.

There was no difference in the mortality in the laying houses between the two lines. The mean winter production was about 12 eggs greater in the nonbroody line. The annual egg record was significantly higher for the nonbroody birds in the nonbroody line than for nonbroody birds in the broody line, and the same was true of the broody birds in the two lines. When all birds were considered, the average annual egg production was 209.8±1.67 in the nonbroody line and 179±1.34 in the broody line.

A biometric study of molt in White Leghorn hens, W. A. HENDRICKS (*Poultry Sci., 12* (*1933*), *No. 5, pp. 287–291*).—The results reported in this paper are based upon several years' investigation on the effect of feeding inorganic sulfur compounds to laying hens at the U.S.D.A. Animal Husbandry Experiment Farm, Beltsville, Md. The data were analyzed for the effect of these compounds upon the molt of White Leghorn hens and upon their egg production.

The feeding of certain inorganic sulfur compounds to laying hens had no consistent effect on the length of the molting period. Late-molting birds had a shorter period than early-molting birds. Slow-molting birds had a higher rate of egg production during the molting period than more rapid-molting birds. During the period when new tail and wing feathers were developing, egg production was retarded more than during the rest of the period. The time required to start molting and the length of the molting period apparently had no effect on the total number of eggs produced during the experimental period of approximately two years, or during the first laying year. In this work the time required to start molting was considered as the number of weeks between the time observations were begun and the appearance of pinfeathers on the neck and breast of the bird.

Effect of confinement on the growth of chicken combs and testes, G. D. BUCKNER, W. M. INSKO, JR., and J. H. MARTIN (*Amer. Jour. Physiol., 102 (1932), No. 2, pp. 271–275, fig. 1*).—This experiment at the Kentucky Experiment Station was designed to determine the effect on the growing chick of confinement under laboratory conditions as compared with normal farm conditions. Day-old chicks were divided into three lots of 120 birds each. Lot 1 was raised in colony brooder houses with free access to grass and direct sunlight, lot 2 was kept for 6 weeks in a hot-water-heated battery brooder and then transferred to colony brooders, while lot 3 was raised for 6 months in battery brooders.

It was found that the cockerels raised under the conditions of lot 3 developed abnormally large combs and smaller testes than those raised in colony brooders.

The egg production of daughters in relation to the hatchability of their dams, M. A. JULL and T. C. BYERLY (*Poultry Sci., 12 (1933), No. 5, pp. 313, 314.*)—Data have been secured on White Leghorns and Rhode Island Reds at the U.S.D.A. Animal Husbandry Experiment Farm at Beltsville, Md., to show whether the selection of dams on the basis of high hatchability would be conducive to high egg production in their daughters. For each of three years and for three years as a whole, the mean egg production was determined for daughters of dams whose hatchability was below the mean hatchability of each pen and for the daughters of dams whose hatchability was above the mean of each pen.

The results showed that breeding for high hatchability was not antagonistic to breeding for high egg production.

Mean annual egg weight in relation to mean weight of first ten eggs laid, M. A. JULL and A. B. GODFREY (*Poultry Sci., 12 (1933), No. 5, pp. 310–312*).—The U.S.D.A. Bureau of Animal Industry analyzed the records of four flocks of White Leghorns, three of which were bred at the Animal Husbandry Experiment Farm at Beltsville, Md., and one at the West Virginia Experiment Station. The birds of each flock were divided into two groups according to whether the mean weight of the first 10 eggs of each bird was below or above the mean egg weight per bird of the first 10 eggs of all the birds in the flock. The mean annual egg weight of the birds of each group was determined.

The coefficients of correlation were high enough in each case to confirm evidence of the tendency for birds that lay relatively small eggs when they begin laying to lay relatively small eggs throughout their first laying year.

Relation of the candling appearance of eggs to their quality, H. J. ALMQUIST (*California Sta. Bul. 561 (1933), pp. 31, figs. 11*).—In an effort to stimulate thought and investigation on egg quality problems, the author has collected and summarized the present technical knowledge of the physical and chemical structure of eggs as related to the problem of grading eggs. Some of the information given includes original results.

The work is divided into three parts—(1) the yolk shadow, in which factors affecting color, position of the yolk, and cloudy whites are discussed, (2) air space, which is devoted to changes in the size and defects of the air space, and (3) shell texture, in which mottled shells and shell porosity are discussed. A portion of the bulletin is devoted to general remarks on the commercial grading of eggs.

Effect of multiple turning upon growth of chick embroyos, T. B. Clark (*Poultry Sci., 12 (1933), No. 5, pp. 279–281*).—At the West Virginia Experiment Station eggs were selected for uniformity in size, shape, and shell texture and placed in an incubator maintained at 101.5° F. One tray of eggs was turned six times daily at 3-hr. intervals, while the second tray was turned twice daily. The embryos in pairs were weighed on the ninety-sixth hour and every 72 hr. thereafter up to and including the nineteenth day of incubation.

A significant difference was found in the average wet weights on the seventh and tenth days of nine embryos turned six times daily and those turned twice daily. There was apparently no cumulative effect from multiple turning during the second half of the incubation period.

Effect of frequent turning on hatchability and distribution of embryo mortality, W. M. Insko, Jr., and J. H. Martin (*Poultry Sci., 12 (1933), No. 5, pp. 282–286, fig. 1*).—The Kentucky Experiment Station reports results, based on a total of 5,809 hen eggs and 2,476 pullet eggs, as to the effect of frequent turning on the distribution of embryo mortality and hatchability. The eggs were placed in either an electric forced-draft or a sectional type hot-water incubator. The first incubator was operated at a temperature of 99° F. and a relative humidity of 61 percent until the eighteenth day, while the second was operated at 103°. The eggs in different lots were turned 2, 4, 6, and 8 times daily.

In the forced-draft incubator there was a direct relationship between the number of times the eggs were turned and their hatchability. In the sectional-type incubator the percentage hatch of total eggs set and fertile eggs set was greater when eggs were turned four times than when turned twice. A decided tendency was observed during the first three days of incubation toward a decrease of embryo mortality with an increase in the number of turnings. From the fourth to the eighteenth day frequent turnings had little or no effect on mortality, but during the remainder of the incubation period there was a slight reduction in mortality as the turnings increased. The percentage of malpositions tended to decrease with an increase in the number of turnings.

Morphological study of differentiation of sex of chicks, A. L. Romanoff (*Poultry Sci., 12 (1933), No. 5, pp. 305–309. figs. 3*).—Measurements of heads and beaks as well as some of the internal organs of more than 200 day-old chicks were made at the [New York] Cornell Experiment Station. This was done to determine whether there were distinctive bodily characters associated with the respective sexes.

The results did not show a very pronounced difference between the sexes, yet did point out distinctly that such differences were present. The length and width of head and size of beak averaged a little larger for males than for females hatched from eggs of corresponding size. The length of intestines and the weight of gizzard and heart were also larger in males, while the length of cecum and weight of liver were slightly greater in females.

Capons and caponizing, C. M. Bice (*Hawaii Sta. Circ. 7 (1933), pp. 14, figs. 10*).—Information necessary for successful caponizing, together with suggestions on the selection of birds and their care after the operation, are presented.

Influence of sex on utilization of feed in turkeys, F. D. Brooks (*Poultry Sci., 12 (1933), No. 5, pp. 299–304*).—At the Indiana Experiment Station a study covering a period of 3 yr. was undertaken to determine the feed utilizing efficiency of male and female turkeys from 18 to 28 weeks of age.

On the basis of gain in weight the male turkeys used their feed more efficiently during this period than did the female turkeys. Males more than doubled their initial weight, while females gained from 80 to 90 percent of their initial weight. The gain per week averaged approximately 0.75 lb. for males and 0.41 lb. for females. The male birds consumed more feed per bird per week than the females, but showed a range of efficiency from 25 to 50 percent greater than females in the use of feed per pound of gain. The method of computing "feed used per bird" or for each pound of weight could not be used to state accurately the feed actually used by the males or females during this period.

Turkeys, T. D. Bell and V. K. Tallent (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 67 (1933), pp. V+16, pls. 4*).—The production, feeding, management, killing, marketing, and control of diseases of turkeys are discussed.

DAIRY FARMING—DAIRYING

[Dairy cattle and dairying investigations in Illinois] (*Illinois Sta. Rpt. 1933, pp. 123–135, figs. 2*).—The dairy cattle studies reported data on environment and size of fat globules, by M. H. Campbell and W. W. Yapp; greater efficiency of abortion-free cows, by Yapp; lowering the cost production of quality milk, by W. L. Gaines and C. S. Rhode; and watching individual cows as a protection of quality of milk, by M. J. Prucha.

Tests with dairy cattle yielded information on the improvement of butter quality by storage studies, by O. R. Overman and O. F. Garrett; off flavors in ice cream, by P. H. Tracy, H. A. Ruehe, S. L. Tuckey, and R. J. Ramsey; overcoming whipping trouble by proper cream temperature, by Tracy and Ramsey; and proper pasteurization as a protection from undulant fever, by Prucha and R. Graham.

Dairying at the Ohio Agricultural Experiment Station, August 1930 to August 1933 (*Ohio Sta. Spec. Circ. 43 (1933), pp. 30, figs. 10*).—Continuing these investigations (E.S.R., 63, p. 668), data obtained in studies with dairy cows are reported on a gestation table based on breeding records of the station herd, the chemical composition of corpora lutea in the milk of pregnant and nonpregnant cows, the relative feeding value of ground soybeans and soybean oil meal, Manamar for growth and milk production, silage without hay for dairy cows, other uses for the silo than storing the corn crop, grain feeding on pasture, and soluble blood flour v. skim milk powder for calves.

Milk studies yielded information on the deficiencies of an exclusive milk ration for calves and vitamin D milk.

Cost of keeping dairy herd sires and suggestions on their selection and management, H. E. Selby and I. R. Jones (*Oregon Sta. Bul. 312 (1933), pp. 37, figs. 8*).—In addition to the data on the cost of keeping dairy herd sires, estimated at $57 per sire for the year ended April 1, 1932, this bulletin presents information on factors affecting their cost, feeding, care and management, breeding dairy cattle, and selection of dairy bulls.

The effect of different planes of protein intake upon milk production.—II, Further comparisons of 16-, 20-, and 24-percent mixtures, E. S. Harrison, E. S. Savage, and S. H. Work (*[New York] Cornell Sta. Bul. 578 (1933), pp. 12, figs. 3*).—Continuing this study (E.S.R., 68, p. 521), further data showed that in every case cows on the 20 percent total protein concentrate mixture produced a little more milk than those on the 16 percent protein mixture. These results indicated that a small increase in milk production could be expected from the higher protein level when fed with No. 2 timothy-clover mixed hay and corn silage. The increase in production was not sufficient to pay for the cost of the increased protein content of the feed. There was no significant stimulating effect on milk flow from the high planes of protein intake.

Appended are comparisons of milk production on the basis of 3.5 percent fat content.

The physiology of dairy cattle (*Jour. Dairy Res.* [*London*], *4* (*1932*), *No. 1*, *pp. 154–176*).—This is a review of the literature dealing with dairy cattle under the following headings: I, Growth, by G. L. Peskett (pp. 154–156); II, Lactation, by J. D. Stirling (pp. 156–163); III, Nutrition—(a) Digestion, by S. Morris (pp. 163–165), (b) Feeding Standards, by J. Mackintosh (pp. 165–170); and IV, Genetics, by A. D. Buchanan Smith and O. J. Robison (pp. 170–176).

Bacteriology and mycology applied to dairying, A. T. R. Mattick, E. R. Hiscox, and M. I. Christian (*Jour. Dairy Res.* [*London*], *4* (*1933*), *No. 2*, *pp. 285–316*).—The dairy research committee of the Empire Marketing Board, England, reviews the literature dealing with dairy science under the following headings: Technic of milk examination, saprophytic flora of milk and milk products, pasteurization of milk, butter, and cheese.

The effect of night on milk production, K. W. D. Campbell (*Jour. Dairy Res.* [*London*], *3* (*1931*), *No. 1*, *pp. 52–60*, *figs. 6*).—Continuing the work at the University of Reading, England (E.S.R., 65, p. 371), this study was undertaken to show more clearly that night itself had a definite effect on the yield and quality of milk. Curves were drawn to show the proportions between morning and evening yield of milk, fat, and fat percentage in the case of five cows and one heifer milked alternately at 6 a.m. and 9 p.m. and again at 6:30 a.m. and 3:30 p.m. In every case the intervals between milkings were 15 and 9 hr.

The results showed that when the longer hours were between night and morning milkings a larger proportion of the milk was produced at the morning milking than was produced at night when the same interval was between morning and night milkings. It was apparent that so far as winter conditions were concerned night or factors operating at night tended toward a high production of milk of low fat content.

The distribution of nitrogen in milk with reference to the solids-not-fat content, W. L. Davies (*Jour. Dairy Res.* [*London*], *4* (*1932*), *No. 1*, *pp. 142–146*).—Studies in the composition of milk samples persistently low in solids-not-fat were carried out at the National Institute for Research in Dairying, England, attention being given to the constituents responsible for the poor quality.

In 62 samples of whole morning milk those that were high in solids-not-fat showed a greater constancy in nitrogen distribution over a consecutive range of samples than did those low in solids-not-fat. The rich samples were characterized by high total nitrogen, low nonprotein nitrogen, and high casein nitrogen, while the poor samples had low total nitrogen, high and variable nonprotein nitrogen, low casein, and consequently high albumin and globulin nitrogen. The casein-albumin-globulin ratio was approximately 14:2.5:1 in samples high in solids-not-fat, but as the solids-not-fat decreased the casein dropped in its proportion to globulin and the albumin showed a slight parallel decrease. There was an increased content of albumin, globulin, and chloride in samples low in solids-not-fat.

Observations on the copper and iron content of milk and other dairy products, W. L. Davies (*Jour. Dairy Res.* [*London*], *3* (*1931*), *No. 1*, *pp. 86–92*).—At the National Institute for Research in Dairying the range in the copper and iron content of 80 samples of fresh, pasteurized, and sterilized milk was determined. When milk contained as little as 1.5 p.p.m. of copper, an "oily" flavor could be detected.

The copper content of dried milk was usually normal, but the iron content was increased above that expected from the iron content of fluid milk. Cheese made in copper vessels had a high copper content, and the iron content of cheese was variable. On the average, butter contained about 0.5 p.p.m. of copper and 1 p.p.m. of iron, and factory-made butter invariably contained more of these elements. The more a milk product was processed, the greater was the contamination with heavy metals. A method for determining the amount of blood in milk by a determination for iron content was proposed.

The mineral constituents and citric acid content of milk, L. A. Allen (*Jour. Dairy Res.* [*London*], *3* (*1931*), *No. 1, pp. 1–51, figs. 9*).—This paper from the Hannah Dairy Research Institute summarizes the present knowledge of the quantities of various mineral constituents in milk, the extent and cause of variations, and the portion of each in the various phases. Because citric acid exerts an influence comparable in many respects with that of the inorganic constituents, a section of the paper is devoted to a review of this compound.

The nutritive value and efficiency of mineralized milk, A. R. Kemmerer, C. A. Elvehjem, E. B. Hart, and J. M. Fargo (*Amer. Jour. Physiol.*, *102* (*1932*), *No. 2, pp. 319–324*).—Milk mineralized with inorganic salts of iron, copper, and manganese was fed to rats and pigs at the Wisconsin Experiment Station to study its nutritive value and efficiency.

Rats that were raised on mineralized milk from weaning grew from 60 to 200 g in 36 days. The average daily gain of 3.9 g was approximately the same as that made by rats on an ordinary ration. It required 2.25 g of milk solids to produce 1 g of gain in weight. The pigs raised on mineralized milk plus cod-liver oil made an average daily gain of 1.26 lb. for a period of 16 weeks, which was practically the same as the gain made on a standard dry ration. To produce 1 lb. of gain in weight 1.97 lb. of milk solids were required, while 3.53 lb. of the dry ration were needed to produce the same gain.

Testing milk and cream, P. A. Wright (*U.S. Dept. Agr., Misc. Pub. 161* (*1933*), *pp. 42, figs. 29*).—This guide describes methods commonly used in routine determinations in commercial milk plants, in the laboratory of the U.S.D.A. Bureau of Dairy Industry, and in the dairy departments of the various State agricultural colleges and experiment stations.

Standardisation of media in the acid ranges with special reference to the use of citric acid and buffer mixtures for yeast and mould media, J. G. Davis (*Jour. Dairy Res.* [*London*], *3* (*1931*), *No. 1, pp. 133–141, figs. 4*).—In this paper from the National Institute for Research in Dairying the sources of error in the adjustment of the media to pH 3.5 are discussed. Titration curves for whey and beer wort with citric, lactic, and tartaric acids are presented. Citric acid was found to be the most convenient acid for adjusting media for yeast and mold counts. From the data obtained with these curves it was not possible to obtain a reliable medium of pH 3.5±0.1, due to variations in the composition of whey and wort, but by adding to the medium a buffer mixture of citric acid monohydrate and potassium citrate monohydrate 64:36 in a concentration of 2 percent the desired accuracy was obtained. The method proposed could be used for any pH between 3 and 6.

A synthetic medium of almost constant composition is described. This may be accurately adjusted by adding given amounts of citric acid without the addition of any buffer mixture.

A contribution to the bacteriology of commercial sterilised milk, I–III, (*Jour. Dairy Res.* [*London*], *3* (*1931*), *No. 1, pp. 106–132, fig. 1*).—Because the bacteriology of commercial sterilized milk had received little attention, the National Institute for Research in Dairying undertook a series of studies on this subject.

I. *General*, E. R. Hiscox and M. I. Christian (pp. 106–112).—The results of a routine examination of samples of commercial sterilized milk over a period of 15 months were analyzed. Three distinct types of spoilage were found, each of which was caused by a definite group of bacteria. The majority of the types of bacteria were identified as *Bacillus mesentericus*, *B. cereus*, and *B. mycoides*.

II. *The "coconut" or "carbolic" taint. A study of the causal organism and the factors governing its spore-formation*, M. I. Christian (pp. 113–129).—The characteristics of an organism causing the "coconut" or "carbolic" taint of commercial sterilized milk are described. Although similar in certain respects to *B. novus* (*Plectridium novum*) Huss, the organism has not been identified. Methods of growing under laboratory conditions and the nature of the growth habits of the organism are described.

III. *The basis of control*, E. R. Hiscox and M. I. Christian (pp. 130–132).—Methods for the control of spoilage of commercial sterilized milk which result from the development of spore-forming bacteria are described.

Homogenized milk, F. J. Doan (*Milk Dealer, 23 (1933), No. 2, pp. 40–42, 64, figs. 4*).—At the Pennsylvania Experiment Station, samples of 3, 6, and 9 percent milk were heated carefully to temperatures of 100°, 110°, 120°, 130°, 140°, 150°, and 160° F., held for periods of 30 min., 15 min., and less than 1 min. (flash), and homogenized at 2,000-lb. pressure. Samples were collected immediately and cooled at once in water and ice at 32°. For comparison, other samples were taken from milk that had not been heated and from milk that had been heated but not homogenized. After holding for 24 hr. at from 35° to 40°, determinations were made on all samples for titratable acidity, pH, and surface tension.

Analyses of the data gave temperatures indicative of the thermal inhibition points for lipase activity in milk preheated before homogenization and held for 24 hr. at 35° to 40°. Additional data covering increases in pH and changes in surface tension gave closely agreeing information on these temperatures. The critical temperatures obtained from the titratable acidity, pH, and surface tension data were 147°, 144°, and 148° for flash heating, 134°, 133°, and 137° for 15-min. exposures, and 132°, 128°, and 129° for 30-min. exposures. These temperatures were considered minimum values.

When milk samples showed no evidence of rancidity after 24 hours' holding at commercial temperatures it was concluded that either the action was too slow to be of importance or that there was no action. Apparently lipase was primarily in the milk plasma rather than associated with the fat.

The autoxidation of butterfat, I, II, L. H. Briggs (*Jour. Dairy Res. [London], 3 (1931), No. 1, pp. 61–79, figs. 8*).—This work was conducted at the Massey Agricultural College, New Zealand.

I. *Factors influencing the reaction.*—A study was made of the influence on the oxidation of butterfat of various substances associated with butter itself or during its manufacture.

Metallic catalysts exerted a great effect in hastening autoxidation, the intensity of their reaction being in the following descending order: Sodium vanadate, copper lactate, iron lactate, and nickel sulfate. Zinc lactate slightly retarded the action. Ultraviolet light, hydrogen peroxide, and fat peroxides had a strong prooxidative effect, and to a lesser extent lactic acid had the same effect. Curd exerted an antioxygenic effect, while humidity, glycerol, triolein, lactose, iodine, potassium iodide, and pasteurization had little or no effect.

II. *Comparison of tests for detecting oxidation changes.*—A study was made of the changes taking place during oxidation, and comparisons were made of certain reactions for detecting such changes.

As a result of oxidation the following differences of the properties of tallowy butter were observed: (1) The amount of unsaturated compounds was decreased, (2) the peroxide content was increased, (3) the amount of free acid was increased, and (4) the color was bleached. Secondary changes occurred simultaneously and resulted in the formation of aldehydes, ketones, etc.

Acid values did not give a satisfactory means for detecting the progress of oxidation. The ordinary method of determining peroxide values was found to be not entirely accurate. The author suggests that for determining small quantities of peroxide a modification of the method used by the Department of Scientific and Industrial Research, England, be used.

The effect of heat upon the rennin coagulation, II, G. M. MOIR (*Jour. Dairy Res.* [*London*], *3* (*1931*), *No. 1, pp. 80–85, fig. 1*).—Continuing this work at the National Institute for Research in Dairying (E.S.R., 70, p. 379), clean milk was flash pasteurized at 165° F. Portions of the same raw milk were treated with small amounts of starter culture and lactic acid, to raise the acidity, before being similarly pasteurized. A comparison of the whey obtained by renneting three raw portions showed that those obtained from acidified milk contained more soluble protein than the original raw milk. The differences in the coagulating time with rennin between raw and pasteurized milk were proportionately much greater in the acidified portions. These differences were correlated with the decreases in the amount of soluble protein found in the whey separated from the coagulum. These results suggested that the decreased coagulability of heated milk with rennin was partially due to flocculation of soluble milk protein upon the casein micelles.

The distribution of salt in Cheddar cheese, F. H. MCDOWALL and L. A. WHELAN (*Jour. Dairy Res.* [*London*], *4* (*1932*), *No. 1, pp. 147–153, figs. 3*).—A study was made at the Dairy Research Institute, New Zealand, of the variations that occur in the salt content of different cheeses from one vat.

The results showed a very appreciable variation in the salt and moisture contents of small plug samples taken from cheeses made in the same vat. The slowness of diffusion on salt in Cheddar cheese was shown by the fact that a plug had to be ground to a paste before good duplicate results for salt content could be obtained. Salt diffusion was slower in Cheddar than in Limburger cheese, probably due to differences in moisture content and texture. These variations in salt concentration may explain in part the difficulties met in obtaining similar results for estimating the number of bacteria in cheese.

A controlled cheese-ripening room, N. S. GOLDING (*Jour. Dairy Res.* [*London*], *3* (*1931*), *No. 1, pp. 101–105, fig. 1*).—A cheese-ripening room at the University of British Columbia and its equipment are described. Complete control of both temperature and humidity is possible in this room.

Factors affecting the solubility of milk powders, I, II (*Jour. Dairy Res.* [*London*], *4* (*1932*), *Nos. 1, pp. 122–141, figs. 8; 2, pp. 265–272, figs. 6*).—Two papers are presented.

I. *The effect of heat on the solubility of milk proteins*, N. C. Wright.—The Hannah Dairy Research Institute, Scotland, undertook a study of the effect of the process of manufacture on the solubility of milk powders. Since the roller-dried powders were quite insoluble as compared with the spray-dried powders, the former were given first consideration.

There was a progressive increase in the insolubility of the casein as a result of the dry heating. The rate of production of insolubility was directly proportional to the time of heating. This was shown by the fact that at 100° C. the casein was rendered 50 percent insoluble in 10 hr., at 117° 35 min. were required, at 123° about 10 min., at 129° about 3 min., and at 139° 40 sec. Neither the albumin-globulin fraction nor the nonprotein nitrogen fraction showed any significant change due to the dry heat treatment. As the heat treatment of the milk powder became more drastic, there was definite evidence of a progressive decrease in the solubility of the nonnitrogenous components and of the total solids, but this decrease in solubility was small.

II. *The influence of temperature of reconstitution on protein solubility*, G. R. Howat and N. C. Wright.—The results indicated that the temperature of reconstitution was of extreme importance in determining the solubility of a milk powder. Extremes in protein insolubility ranged from 70 percent when the powder was reconstituted at 20° C. to 25 percent when reconstituted at 50°. At 100° the value lay between 30 and 40 percent. It appeared that the increase in solubility between 20° and 50° was due to the presence of protein which had been made insoluble by overheating in a dry state. The protein that remained insoluble at 50° was that fraction that had been completely denatured by moist heating during the drying process and was, therefore, irreversibly coagulated. Decreased solubility occurring between 50° and 100° was apparently the result of the heat treatment during reconstitution. There were no indications that the fat content of the powder interfered with the results.

It is recommended that in order to get the most valuable indication of the extent and nature of the protein insolubility the milk powders should be reconstituted at both 20° and 50°.

VETERINARY MEDICINE

The physiology of domestic animals, H. H. Dukes (*Ann Arbor, Mich.: Edwards Bros., 1933, pp. XIX+391, figs. 218*).—This work, which includes a foreword by H. D. Bergman (p. VI), an introduction on the physicochemical basis of physiological phenomena by E. A. Hewitt (pp. XI–XIX), and a part on reproduction by G. W. McNutt (pp. 345–384), is presented in 11 parts with a total of 39 chapters, each part containing a list of references.

[Work with diseases and parasites of livestock] (*Amer. Soc. Anim. Prod. Proc., 1932, pp. 105–109, figs. 4; 265–269, 277–281*).—The contributions presented include Strongyle Infestation in Horses, by R. Graham (pp. 105–109); The Evidence for Genetic Resistance to Bacterial Disease in Animals, by W. V. Lambert (pp. 265–269); and Breeding Results in a Herd of Cattle Infected with Contagious Abortion, by W. W. Yapp and A. F. Kuhlman (pp. 277–281).

[Work of the U.S. Department of Agriculture with livestock diseases, 1933] (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. 72–74*).—Data are reported on the control work conducted in the South with the kidney worm of swine, bovine tuberculosis eradication, sheep scabies, and the discovery of a new disinfectant—sodium orthophenylphenate.

[Work in animal pathology in Colorado] (*Colorado Sta. Rpt. 1933, pp. 21, 22*).—The work of the year is briefly referred to under the headings of sheep losses in feed lots caused by a filtrable virus, coccidiosis in cattle, contagious abortion, blackleg in sheep, and encephalomyelitis (Kansas horse disease).

[Report of work in animal pathology by the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 78, 79, 105–107, 108–111, 117–121, figs. 4*).—The work of the year with diseases of livestock (E.S.R., 68, p. 666) by R. Graham, F. Thorp, Jr., E. E. Slatter, E. H. Barger, J. P. Torrey, and V. M. Michael, includes that with infectious abortion, control of parasites of the horse, pullorum disease control, laryngotracheitis, and use of pigeon pox in prevention of fowl pox.

Report of the veterinary director general for the year ending March 31, 1933, G. Hilton et al. (*Canada Dept. Agr., Rpt. Vet. Dir. Gen., 1933, pp. 54*).—This report (E.S.R., 69, p. 578) presents accounts of the contagious diseases division by A. E. Cameron (pp. 12–32), with information on the restricted areas for the eradication of bovine tuberculosis; the meat and canned foods division by R. Barnes (pp. 33–39); and the pathological division by E. A. Watson (pp. 40–54).

The account of work in pathology includes Studies of Bacillus Calmette-Guérin and Prophylactic Vaccination of Cattle by Means of B.C.G., by E. A. Watson, C. W. McIntosh, and H. Konst (pp. 41, 42); Distemper of Foxes, Mink, and Other Fur Animals, by E. A. Watson, P. J. G. Plummer, and J. R. West (pp. 42–46); Serological Examinations for *Brucella abortus* Infection (pp. 46, 47), Attempts to Produce an Anti-serum against *Brucella abortus* Infection (p. 47), Experiments to Immunize Rabbits to *Br[ucella] abortus* (p. 47), The Relationship of Streptococcic Infection in the Udder to Infection by the *Brucella abortus* (p. 48), and Viability of Streptococci in Milk (p. 49), all by C. A. Mitchell, F. A. Humphreys, and R. V. L. Walker; Infectious Vaginitis of Cattle, by C. A. Mitchell, R. V. L. Walker, and F. A. Humphreys (pp. 49, 50); Johne's Disease or Paratuberculosis of Cattle, by C. W. McIntosh and H. Konst (pp. 50, 51); Viability of Rabies Virus in Raw and in Pasteurized Milk, by N. J. Holmes (p. 51); Cattle Warbles [Northern Cattle Grub and Common Cattle Grub], by C. W. McIntosh (pp. 51, 52); and Parasitology (p. 52).

[Contributions to comparative physiology and pathology] (*Vet. Rev., 13 (1933), Nos. 41, pp. 1015–1020; 42, pp. 1046–1054; 43, pp. 1074–1081; 44, pp. 1112–1117; 45, pp. 1160–1170, figs. 7; 46, pp. 1202–1208; 47, pp. 1236–1248, figs. 12; 48, pp. 1282–1287; 49, pp. 1314–1320*).—Contributions presented at the annual congress of the National Veterinary Medical Association of Great Britian and Ireland, held at Llandudno, Wales, in September 1933, include the following: Vaccination against Bovine Contagious Abortion and the Relation of This Disease to Undulant Fever of Man, by W. H. Andrews (pp. 1015–1020); The Significance of (a) Acid-Fast Bacilli, (b) *Bacillus coli* in Milk, by G. O. Davies (pp. 1046–1054); Johne's Disease, including Johne's Disease in Sheep, by F. C. Minett (pp. 1074–1081); Meat Preservation, by W. R. Wooldridge (pp. 1112–1117); Helminths of Economic Importance in Farm Animals, excluding Poultry, by A. W. N. Pillers (pp. 1160–1170); Diseases and Accidents Referable to the Hunting Field and to the Turf, by A. A. Comerford (pp. 1202–1208); Fractures and Dislocations in Small Animals, by J. McCunn (pp. 1236–1248); The Relationship of Poultry Diseases to the Practitioner, by H. Dobson (pp. 1282–1287); and Swine Fever and Enteritis in Young Pigs, by J. O. Powley (pp. 1314–1320).

Report of the deputy director (animal industry) and chief veterinary officer, H. H. Brassey-Edwards (*Kenya Dept. Agr. Ann. Rpt., 1932, pp. 184–270*).—The work of the year (E.S.R., 68, p. 666) with infectious diseases of livestock is reported upon.

Report of the chief veterinary research officer, R. Daubney (*Kenya Dept. Agr. Ann. Rpt., 1932, pp. 271–291*).—Particular attention is given in this report (E.S.R., 68, p. 666) to research work with rinderpest, foot-and-mouth disease, Rift Valley fever, rabies, contagious bovine pleuropneumonia, respiratory diseases of sheep, and hemorrhagic septicemia in cattle.

Report of the director of veterinary research for the year ending December 31st, 1932, D. A. Lawrence (*Rhodesia Agr. Jour., 30 (1933), No. 11, pp. 919–934*).—A brief account of the work of the year, including research work with foot-and-mouth disease, diseases of guinea pigs, diseases of pigs and sheep, etc.

Abridged report of the director of veterinary research for the year 1931, L. E. W. Bevan (*South. Rhodesia, Dir. Vet. Res. Abridged Rpt., 1931, pp. 3*).—This report refers briefly to research work with trypanosomiasis, foot-and-mouth disease, East Coast fever, and sheep diseases.

Annual report of the veterinary department for the year ended 31st December 1932, W. F. Poulton et al. (*Uganda Vet. Dept. Ann. Rpt., 1932, pp. 44, pl. 1*).—The main part of this report (E.S.R., 68, p. 667) relates to disease control and deals particularly with rinderpest and trypanosomiasis (pp. 3–20). The annual report of the veterinary pathologist, R. W. M. Mettam (pp. 21–37), is included.

Eighth report of the Government Institute for Veterinary Research (*[Chosen] Govt. Inst. Vet. Res. Rpt., 8 (1933), pp. [1]+42, pls. 9; Eng. abs. pp. 1, 14–16, 18; Ger. abs. pp. 2–13, 17*).—The contributions presented in this report (E.S.R., 68, p. 376) include seven articles previously noted, together with the following: The Detection of Pullorum Infection in the Fowl, by T. Konno and Y. Goto (pp. 5, 6); the Pathological Anatomy of Korean Fowl Plague, by T. Fukushima, K. Shimomura, and S. Oyama (pp. 7–9); The Virulence of the Virus of So-Called "Korean Fowl Plague", by J. Nakamura, S. Oyama, and N. Tomonaga (pp. 10, 11); The Question of Necrosis in Fowl Pest Encephalitis, by T. Fukushima (pp. 12, 13); Contribution to the Knowledge of Globidium Invasion in the Calf, by T. Fukushima and O. Isshiki (p. 17); and The Distribution of Plasma Proteins in the Blood of Korean Cattle, by S. Ikegaya (p. 18).

The gender of generic names of bacteria, G. P. Van Eseltine (*Jour. Bact., 26 (1933), No. 6, pp. 569–571*).—This is a contribution from the New York State Experiment Station.

Preliminary note on the treatment of infected wounds with the larva of Wohlfahrtia nuba, C. Grantham-Hill (*Roy. Soc. Trop. Med. and Hyg. Trans., 27 (1933), No. 1, pp. 93–98, pl. 1*).—Eight cases are described in which the introduction of large numbers of the larvae of *W. nuba* Wied., the form found in human cases of wound infestation in different parts of the Sudan, was followed by rapid healing.

Optimal proportions in agglutination, with reference to the antigenic analysis of the Brucella group of organisms, A. A. Miles (*Brit. Jour. Expt. Path., 14 (1933), No. 1, pp. 43–56, figs. 4*).—The author has found the velocity of agglutination in a constant volume of fluid to be at a maximum when the ratio of the concentrations of bacteria and immune serum has one of two values, depending on the method of titration. These values are constant and bear a constant relationship to one another for a given antiserum and antigen. One ratio is determined by titrating antigen against a constant antiserum concentration (the "Dean and Webb" method), the other by titrating antiserum against a constant antigen concentration (the "Ramon" method). The significance of and the relations between the two ratios are discussed. Secondary optimal ratios of as yet unknown significance in the constant-antigen titrations are described. Representative smooth strains of *B. abortus*, bovine variety, and *B. abortus*, porcine variety, are distinguishable from *B. melitensis* by use of the optimal proportions technic. The *B. abortus* varieties are indistinguishable from one another. The limitations of the method applied to antigenic analysis of bacteria are discussed.

Examination of the type of Brucella cultures in the Netherlands [trans. title], J. van der Hoeden (*Tijdschr. Diergeneesk., 60 (1933), No. 21, pp. 1148–1151; Ger., Eng., Fr. abs., p. 1151*).—In typing tests made of 82 cultures of *Brucella* isolated in the Netherlands from man, cattle, horses, and a dog, based upon the bacteriostatic properties of some aniline dyes and hydrogen sulfide production, all were found to belong to the bovine type.

Experiments on guinea pigs with [Brucella] abortus bacterin [trans. title], K. A. TULLBERG (*Skand. Vet. Tidskr., 23 (1933), No. 9, pp. 433–445; Eng. abs., pp. 443–445*).—In the experiments conducted differences were found in the course of the infection in bacterin-treated and nonbacterin-treated guinea pigs. During the first 6 weeks the mean agglutination values, in the case of the bacterin-treated animals, were, with one exception, lower, and frequently essentially lower, than the corresponding mean agglutination values of the nonbacterin-treated animals. The same condition was observed during the last 2 months of the period of observation, during the seventh and eighth months after infection. At the close of the observation period the agglutination had disappeared in the case of one of the bacterin-treated guinea pigs, while the three other bacterin-treated animals displayed such low agglutination values as 50, 70, and 70. At the same time all the nonbacterin-treated animals still showed agglutination values as high as 200. This is considered to show that the power of resistance of the bacterin-treated guinea pigs against infection had been increased by the treatment.

The liver fluke in Cuba, I, P. KOURI and R. ARENAS (*La Distomatosis hepatica en Cuba. Habana, 1932, vol. 1, pp.* [7]+*175, figs. 30*).—A report is given of cases of the liver fluke disease in man in Cuba and its treatment, particularly of the specific action of emetine. A list is given of 46 references to the literature, and abstracts of 10 contributions on the disease are appended.

Studies on pseudorabies (infectious bulbar paralysis, mad itch).—I, Histology of the disease, with a note on the symptomatology, E. W. HURST (*Jour. Expt. Med., 58 (1933), No. 4, pp. 415–433, pls. 3*).—The author finds that "the histology of pseudorabies differs materially in various animal species. In the rabbit, subcutaneous, intradermal, or intramuscular inoculation leads to local inflammation and necrosis. The infection ascends the peripheral nerve (possibly both interstitially and by the axis cylinders) to the corresponding spinal ganglia and segments of the spinal cord, where primary degeneration of nerve and glial cells takes place. The nerve cell changes are probably responsible for the cardinal symptom of the disease, itching. Death ensues soon after virus reaches the medulla, before visible changes have been produced here. Intracerebral inoculation is followed by characteristic lesions in the meninges, in subpial glial cells, and in superficially placed nerve cells. Morbid changes in the lungs are not necessarily related to the presence of virus, but specific lesions may be present. Intranuclear inclusions bearing some resemblance to those in herpetic encephalitis, yellow fever, etc., occur in cells derived from all embryonic layers.

"The disease in the guinea pig resembles closely that in the rabbit and is modified only by the slightly greater resistance of the animal. In the monkey after intracerebral inoculation widespread degeneration and necrosis of cortical nerve cells are accompanied by the appearance of specific nuclear alterations in nerve and glial cells, but not in cells of mesodermal origin. No lesions are found in other viscera. In the spontaneous disease in the cow, lesions approximate more closely to those in the monkey than to those in the rabbit. In the pig vascular and interstitial lesions predominate, nerve cell degeneration is relatively slight, and typical inclusions are not observed. These differences probably explain the benign course of the malady following subcutaneous inoculation in this animal. The lymphatic system, too, participates in the reaction to the virus."

The diversity of types found in stock cultures of Streptococcus epidemicus, P. R. Edwards (*Amer. Jour. Hyg., 18 (1933), No. 2, pp. 345–353*).—In studies conducted at the Kentucky Experiment Station two types of streptococci were found in cultures classified as *S. epidemicus.* "One of these types is identical with the sorbitol-fermenting streptococci of animal origin, the other corresponds to the human type. Of the 18 cultures of streptococci corresponding to the animal strains, 12 were isolated from cows. Of the 6 cultures of this type said to have been isolated from humans, duplicates of 5 were obtained from other laboratories. All the duplicates were members of the human type.

"Sorbitol-fermenting organisms of this group occur rarely, if at all, in human infections. Cultures isolated from cows and thought to be *S. epidemicus* should be tested for their ability to ferment sorbitol and trehalose."

A list is given of 18 references to the literature.

Observations on the defense mechanism in Trypanosoma equiperdum and Trypanosoma lewisi infections in guinea pigs and rats, H. A. Poindexter (*Amer. Jour. Trop. Med., 13 (1933), No. 6, pp. 555–575*).—This contribution is presented under the headings of the effect of glucose injection on the course of *T. equiperdum* infection in guinea pigs, the relation of the spleen to resistance in trypanosome infections, effects of *T. equiperdum* infection on pregnant guinea pigs, terminal decrease in the number of trypanosomes in rats infected with *T. equiperdum,* effect of trypanosomiasis on the fragility of the red cells, increase in large monocytes and platelets in rats infected with *T. lewisi,* and some observations on cross-immunity to trypanosome infections, the details being presented in tabular form. The account is presented in connection with a list of 16 references to the literature.

Studies on Bacillus Calmette-Guérin (B.C.G.) and vaccination against tuberculosis, E A. Watson (*Canad. Jour. Res., 9 (1933), No. 2, pp. 128–136, pls. 2*).—This report is based upon vaccination trials and biological studies of B.C.G. carried on by the Canadian Department of Agriculture for a period of more than 8 yr.

Conducted under conditions of continuous exposure to natural infection through cohabitation with tuberculous animals, tests varying in duration from 2 mo. to 4½ yr. have been completed on 44 vaccinated cattle and 28 unvaccinated controls. In trials of short duration the percentage of cattle free from tuberculosis is slightly in favor of the vaccinated. In all cattle over 2 yr. of age tuberculosis was present to a greater or less degree. Judged by slight, moderate, and extensive tuberculous involvement, there is some evidence of a greater resistance in the vaccinated cattle up to 2½ yr. of age, 26 percent of which showed extensive generalized tuberculosis, as compared with 53 percent of the unvaccinated. In the age group ranging from 2½ to 4½ yr. no greater resistance is found in the vaccinated than in the unvaccinated cattle. It has not been possible to demonstrate a true lasting immunity by this method of vaccination, and such increased relative resistance as B.C.G. may confer during the early months of life declines and soon disappears and fails to protect cattle exposed for 2 yr. to natural sources of infection from developing typical tuberculosis.

"The attenuated virulence and potential pathogenicity of B.C.G. have been studied for a period of over 8 yr. in three original strains received in the years 1924, 1925, and 1927, and in the cultural descendants of each strain up to the year 1932. Each strain proved to possess an unfixed, potential virulence capable of exaltation on the one hand and of complete attenuation or reduction on the other. This virulence, manifested but rarely and only in the earlier descendants, 1924–28, declined under serial cultivation and periodic return to the special bile-potato media and apparently died out in the 1928–29 generations, for none of the subsequent descendants tested proved capable of causing progressive reinoculable tuberculosis in laboratory animals."

Rules for the tuberculinization of domestic animals in Egypt [trans. title], M. Carpano (*Egypt Min. Agr., Serv. Tech. et Sci. Bul. 133 (1933), pp. 16*).—A description is given of the methods employed in the application of the tuberculin test.

The most practical methods of combating parasitic gastritis and fluke infestation of ruminants under field conditions in India, G. D. Bhalerao (*Agr. and Livestock in India, 3 (1933), No. 4, pp. 354–360*).—This contribution deals with parasitic gastritis, caused by *Haemonchus contortus, H. similis,* and *Mecistocirrus digitatus,* of which the last named is the most dangerous. "The flukes occurring in domestic animals in India are *Fasciola gigantica, F. hepatica, Dicrocoelium dentriticum, Eurytrema coelomaticum,* and *E. dajii* and *Paramphistomum* spp. Of these the *Eurytrema* spp. occur very rarely. *D. dentriticum* does not cause much harm except in abnormal cases of infection. The fluke that causes the greatest harm to our domestic ruminants is *F. gigantica* and next to it *F. hepatica.*"

Studies on a herd infected with Brucella abortus.—I, A study of the effects of vaccination and of segregation on the control of Brucella abortus infection, D. W. Caldwell, N. J. Parker, and E. M. Medlar (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 1, pp. 75–90, figs. 2*).—In an attempt to control infectious abortion in a valuable dairy herd the authors found that vaccination with living *B. abortus* bacilli decreased the percentage of abortions in the herd but increased the percentage of retained placentas. "Segregation was found more effective than vaccination in the control and elimination of infectious abortion. Vaccination without segregation was not successful in the elimination of the infection. Agglutinins were demonstrated in the blood serum of 86 percent of the vaccinated cows tested in 1927. Agglutinins persisted in the blood as long as the animals were under observation. In one case this was nine years after vaccination. Occasionally, vaccinated reactors with maximum titers of 1:120 became negative. This was not true of vaccinated cows with higher titers.

"Monthly serological tests failed to show any correlation between time of years' breeding period, calving period, or milk-production period and an increase or decrease in agglutination titer. Tests made on the herd at one time were as significant as tests made at any other time. Repeated tests are essential to insure the maintenance of a negative herd."

The account is presented in connection with a list of 29 references to the literature.

Immunisation experiments and vaccine treatment in infectious abortion, H. Holth (*Skand. Vet. Tidskr., 23 (1933), No. 11, pp. 557–602, figs. 14; Skand. abs., pp. 599–602*).—The details of work conducted at the State Veterinary Institute at Oslo, Norway, with an antiformin vaccine are reported, no conclusions being drawn.

Histological examinations of the normal and the infected heifer udder [trans. title], H. O. Pedersen (*Skand. Vet. Tidskr., 23 (1933), No. 11, pp. 603–624, figs. 13; Eng. abs., pp. 621–624*).—An account is given of the histological structure of the mammary gland of the normal heifer and of a histological examination made of the mammary glands of eight heifers that had been killed from 2 to 3½ mo. after the first injection of the infectious abortion culture.

Gas gangrene and two case reports in cattle, C. J. MARSHALL (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 1, pp. 58–64*).—A general account is followed by reports of two cases of the disease due to *Clostridium* sp. as observed in high-producing dairy cows.

The diagnosis and control of mastitis, D. H. UDALL and S. D. JOHNSON (*[New York] Cornell Sta. Bul. 579 (1933), pp. 15, fig. 1*).—Following a brief introduction, the examination of milk, the test for alkalinity, its bacteriological examination, the physical examination of the udder, and means for prevention of mastitis are considered. Detailed reports are given of eight cases, presented in large part in tabular form.

Bacteriological and serological work with paratyphosus in the calf [trans. title], A. CLARENBURG (*Tijdschr. Diergeneesk., 60 (1933), No. 20, pp. 1092–1100; Ger., Eng. abs., p. 1100*).—In a study of healthy animals in a stable where paratyphosus occurred in cows, the author found 2 of 4 calves and 2 of 22 cows to excrete Gärtner bacilli (*Salmonella enteritidis*) in the feces. No specific agglutinins were found at first in the blood serum of these animals. Upon slaughter 20 days later the 2 bacilli-excreting calves showed typical paratyphoid foci in liver and kidneys, but no bacilli in the organs or intestinal contents. On the day of slaughter the blood serum of these animals agglutinated in dilutions of 1:200 and 1:400, respectively, with Gärtner bacilli. The danger of such carriers to both man and animals is emphasized.

Two diseases of sheep of economic importance in South Australia, C. T. MCKENNA (*Jour. Dept. Agr. So. Aust., 37 (1933), No. 3, pp. 275–278, 280–284*).—The affections considered are parasitic gastroenteritis of sheep and infectious enterotoxemia of sheep.

Acetonuria in sheep [trans. title], J. A. BEIJERS (*Tijdschr. Diergeneesk., 60 (1933), No. 20, pp. 1081–1091; Ger., Eng., Fr. abs., pp. 1089–1091*).—A description is given of a disease that occurs in sheep in the last weeks of gestation, or, in some cases, just after parturition. The disease is characterized by a pronounced acetonuria, the urine often containing more than 1 percent of acetone. The disease is thought to be identical with domsiekte disease of South Africa, the acidosis of pregnant ewes in England and America. Upon examination, a fatty and parenchymatous liver degeneration and at times an acute enteritis are found. It is not identical with the affection in advanced pregnant sheep with the same clinical picture and liver degeneration that occurs in some parts of the Netherlands.

The detection of proteins of the nematode Haemonchus contortus in the sera of infected sheep and goats, J. E. STUMBERG (*Amer. Jour. Hyg., 18 (1933), No. 2, pp. 247–265, figs. 4*).—The author reports that, "by means of what is essentially an anaphylactic test, *Haemonchus* protein was detectable in dilution of 1:50,000. The test consisted of a rise in relative percentage and absolute number of eosinophilic leucocytes in the circulating blood following injection of extract into sensitized guinea pigs. Injection of anti-*Haemonchus* immune rabbit serum into unsensitized guinea pigs previously injected with *Haemonchus* extract caused a rise in percentage of eosinophiles as long as 17 days after injection of extract.

"Sera of *Haemonchus*-infected sheep and goats intraperitoneally injected into actively or passively sensitized and control guinea pigs caused an occasional rise in relative percentage of eosinophiles in controls, and always caused a greater rise in sensitized guinea pigs. Sera of helminth-free sheep, of a sheep infected with nematodes other than *Haemonchus*, and of a sheep following loss of *Haemonchus* infection, failed to cause a rise in percentage of eosinophiles in sensitized and control guinea pigs. Changing the order of injection did not inhibit the reaction. The power of stimulating eosinophile rise diminished with progressive dilution. Injection of immune rabbit serum into unsensitized guinea pigs previously injected with serum of an infected sheep caused a rise in eosinophiles up to the twelfth day but not on the fifteenth. The reaction was enhanced by allowing several days to elapse between injection of the infected sheep serum and of the immune rabbit serum.

"This modification of the technic showed clearly that on injection of sera of *Haemonchus*-infected sheep, of sheep after almost complete loss of infection, and of a helminth-free sheep, the rise in eosinophiles after passive sensitization is dependent on the presence of a heavy infection of *Haemonchus.* The conclusion is drawn that *Haemonchus* proteins are absorbed through the alimentary tract into the circulating blood of heavily infected sheep and goats in sufficiently unaltered form to react with specific antibodies in an anaphylactic test."

On the presence of a rickettsia-like organism in the lymphocytes of sheep, H. McL. Gordon (*Aust. Jour. Expt. Biol. and Med. Sci., 11 (1933), No. 2, pp. 95–97, figs. 3*).—Chromatin-staining bodies observed in lymphocytes during the examination of blood smears whose appearance suggested their being rickettsiae, are thought to represent *Rickettsia melophagi.* This view is based on their resemblance, both in morphology and arrangement, to the other *Rickettsia* spp. of sheep, and on the fact that they were not present in newborn lambs which were free from the sheep tick, but appeared two weeks later when these lambs became infested with this parasite.

A method of establishing pure infestations with adult trichostrongylids in sheep, H. McL. Gordon (*Aust. Jour. Expt. Biol. and Med. Sci., 11 (1933), No. 2, pp. 151, 152*).—The author finds that it is a relatively simple matter to set up an infestation with *Ostertagia* spp. and *Haemonchus contortus* in lambs merely by drenching with adult parasites in saline. Attempts to establish infestations with *Trichostrongylus* spp. and *Nematodirus* spp. in a similar manner were not successful.

Pleuropneumonia of goats in Greece and the results of an experimental study [trans. title], M. Stylianopoulos (*Rev. Gén. Méd. Vét., 42 (1933), No. 499, pp. 401–416*).—The author reports studies made of pleuropneumonia of the goat, which was introduced into Greece from Asia Minor in 1920 and has recurred each year up to 1931.

Acute enteritis in young pigs due to infection with colon group, C. N. McBryde (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 1, pp. 36–50, fig. 1*).—This is a report of an investigation conducted at a large garbage-feeding ranch in southern California, where there was a heavy mortality in pigs from 2 to 5 days old. The clinical symptoms of the disease were weakness, characterized by unsteady gait and disinclination to move, roughness of hair, emaciation, and wrinkled appearance of the skin. In typical cases, the little pigs presented a droopy and listless appearance, standing with their heads lowered and noses almost touching the ground in a state of apparent stupor. About 50 percent showed scours.

Bacteriological and histological studies led to the conclusion that the disease was the result of an invasion of *Bacillus coli,* which had assumed pathogenic and invasive properties. Agglutination tests with *Brucella* antigen indicated the widespread prevalence of brucelliasis in the herd, and it is believed that this disease was a primary factor responsible for the birth of many pigs below par, with a lowered resistance, rendering them liable to infection by *B. coli.*

In the absence of any definite or well-supervised system of breeding, it is believed that prolonged inbreeding also may have been a factor responsible for the farrowing of weak pigs of low vitality.

Studies in hog cholera immunity, J. H. Burt (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 1, pp. 91–99*).—Investigations conducted at the Kansas Experiment station indicate that "it is possible to produce permanent immunity against hog cholera in the offspring from immune sows if the baby pigs are inoculated with 1.5 to 2 cc of active hog cholera virus before they are 18 days old. Sows immunized with virus only will transmit immunity to their offspring in their second and third litters as well as in their first litter. This immunity is strong enough and permanent enough to withstand successfully a second inoculation of 5 cc of virus 94 to 143 days after the first inoculation. This immunity was permanent enough to permit four sows, 18 months old, to be hyperimmunized by the injection intravenously of 5 cc of virus to the pound of body weight."

Extensive field tests are considered necessary before final conclusions can be drawn.

A spindle-cell sarcoma involving the spinal cord, J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 1, pp. 116, 117, figs. 2*).—This contribution from the Indiana Experiment Station reports the case of a spindle-cell sarcoma which involved the spinal cord of a pig weighing about 20 lb.

Resistance to infestation with Trichinella spiralis in hogs: The eosinophilic and precipitin response, G. W. Bachman and R. R. Molina (*Amer. Jour. Hyg., 18 (1933), No. 2, pp. 266–294, figs. 7*).—In work conducted in Puerto Rico total leucocyte counts, differentials, precipitation tests, and estimation of hemoglobin percentages were made of 10 young hogs for 345 days at 5-day intervals. These animals were fed from 500 to 600 g of trichinous meat every 80 and 40 days. Three biopsies were performed previous to each feeding, and the average number of larvae in from 20 to 30 microscopic fields was determined.

"In the 5 animals that survived there were a decided eosinophilia (highest 32 percent) and high precipitin titer (1 in 6,000) during first infestation, but a rapid decrease of eosinophiles and a total absence of precipitins in subsequent infestations. Convalescence during repeated infestations was not correlated with high eosinophilia and precipitin titer. Immunization with intramuscular injections of variable amounts of 1 percent suspension of trichina powder in Coca's alkaline solution produced an eosinophilia (16 percent) in titer (1 in 6,000). Immunization previous to infestation afforded no protection against trichiniasis. The authors believe that the resistance to hyperinfestation is due to a retention of antibodies and a local mobilization of leucocytes and cells of the reticuloendothelial system in the intestinal wall of the host."

The account is presented in connection with a list of 13 references to the literature.

Trias and blood picture of the stallion before and after castration [trans. title], S. Milan (*Vet. Arhiv., 3 (1933), No. 11, pp. 485–521, figs. 24; Eng. abs., pp. 520, 521*).—The findings in examinations of 12 stallions made one day before and several days after castration are reported upon. A list is given of 27 references to the literature.

Equine encephalomyelitis, B. F. Howitt (*Jour. Infect. Diseases, 51 (1932), No. 3, pp. 493–510*).—This contribution deals with the subject under the headings of recovery of the virus of equine encephalomyelitis from the blood of experimentally infected animals, mode of administration of the virus and its distribution in the experimentally infected animal body, results of in vitro neutralization tests with the serum of animals recovered from equine encephalomyelitis, and serum therapy in guinea pigs experimentally infected.

It was found that "the virus of equine encephalomyelitis may be recovered during the febrile period from both the cardiac blood and the peripheral circulation of experimentally infected animals, including the horse. It is rarely found after defervescence. It appears in the blood of the guinea pig at about the tenth hour after an intracranial inoculation of the virus and at about the thirty-third hour when the virus is given by the nasal route. It continues in the circulation until the decline in temperature and the subsequent prostration of the animal. The virus is contained in the whole blood and in the serum of the infected animal, but not in the washed erythrocytes. The virus has been recovered from various parts of the central nervous system of different animals, and during the febrile period has been found in the liver, spleen, kidneys, adrenal glands, and salivary glands of the guinea pig. It has not been recovered from the filtered salivary secretions of guinea pigs, from the concentrated filtrate of drinking water used by infected animals, or from the urine and feces of infected guinea pigs.

"The disease can be transmitted by inoculation into the brain, the anterior chamber of the eye, the peritoneum, or the veins; also when given intracutaneously or subcutaneously or by intranasal instillation. The results were negative after inoculation of the virus into rabbit testicles, after inoculation into the conjunctiva and footpads of the guinea pig, after percutaneous injection, and after feeding."

It was determined that "hyperimmune serum given intramuscularly will protect a guinea pig against an intracerebral injection of the virus of equine encephalomyelitis through the fourth hour but not after the tenth, while it also is of therapeutic value when the virus is given by the nasal route. Such serum is of value when used as a prophylactic, since it protects guinea pigs against intracerebral or intranasal inoculation if given from 24 hr. to 3 or 4 days before the virus. A potent immune serum given intramuscularly in the amount of 0.5, 1, 2, or 3 cc will protect a guinea pig against a simultaneous injection of 0.3 cc of virus suspension into the brain; 0.3 cc of serum fails to protect.

"A definite correlation can be established between the appearance of the virus in the general circulation of the experimental animal and the time of most effective treatment with immune serum. Protection is unreliable after the virus has appeared in the blood."

The present status of anthelmintic medication for gastrointestinal parasites of the horse, W. H. Wright (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 1, pp. 11–24*).—This contribution is presented in connection with a list of 14 references to the literature.

The production in dogs of chronic black tongue with anemia, C. P. Rhoads and D. K. Miller (*Jour. Expt. Med., 58 (1933), No. 5, pp. 585–605, pls. 3, figs. 6*).—Through the feeding of a particular diet, apparently lacking a substance closely associated with vitamin B_2(G), a chronic disease may be produced irregularly in dogs. The disease is characterized by atrophic glossitis, diarrhea, loss of weight, and anemia. The disease can be prevented and relieved by materials rich in vitamin B_2(G).

Infectious papillomatosis of rabbits, R. E. Shope (*Jour. Expt. Med., 58 (1933), No. 5, pp. 607–624, pls. 3*).—The author describes a condition resulting from a papilloma which occurs in wild cottontail rabbits and has been found to be transmissible to both wild and domestic rabbits.

"It has been found that the causative agent is readily filtrable through Berkefeld but not regularly through Seitz filters, that it stores well in glycerol, that it is still active after heating to 67° C. for 30 min. (but not after heating to 70°), and that it exhibits a marked tropism for cutaneous epithelium. The activities and properties of the papilloma-producing agent warrant its classification as a filtrable virus.

"Rabbits carrying experimentally produced papillomata are partially or completely immune to reinfection and, furthermore, their sera partially or completely neutralize the causative virus. The disease is transmissible in series through wild rabbits, and virus of wild rabbit origin is readily transmissible to domestic rabbits, producing in this species papillomata identical in appearance with those found in wild rabbits. However, the condition is not transmissible in series through domestic rabbits. The possible significance of this observation has been discussed. The virus of infectious papillomatosis is not related immunologically to either the virus of infectious fibroma or to that of infectious myxoma of rabbits."

A note on its histopathology by E. W. Hurst is included (pp. 610, 611).

Epizootic fox encephalitis.—IV, The intranuclear inclusions, R. G. Green, M. S. Katter, J. E. Shillinger, and K. B. Hanson (*Amer. Jour. Hyg., 18 (1933), No. 2, pp. 462–481, figs. 13*).—In their continuation of the studies previously noted (E.S.R., 66, p. 578), the authors have found intranuclear inclusions to occur in the endothelial cells of foxes dying from epizootic fox encephalitis. "They are found consistently in foxes dying of the natural infection and after experimental inoculation. Similar inclusions are not found in foxes dying from natural infections with the distemper virus of Laidlaw and Dunkin. Inclusions develop in the endothelial cells of the central nervous system after experimental inoculation of fox encephalitis virus by intraperitoneal, intramuscular, and intratesticular injection, but with these experimental infections they do not occur in the ependymal cells. In experimental infections following inoculation by cisterna puncture and by intracranial injection where the virus is injected into the ventricles, intranuclear inclusions are found in the ependymal cells as well as in the endothelial cells of the brain and spinal cord.

"The occurrence of intranuclear inclusions in both natural and experimental infections, the absence of these inclusions in other diseases, and the production of inclusions in the ependymal cells only when the virus is introduced into the cerebrospinal fluid demonstrates that these intranuclear bodies are characteristic of the fox encephalitis virus."

The parasitic worms of poultry, and the diseases which they cause, E. L. Taylor (*Agr. and Livestock in India, 3 (1933), No. 5, pp. 475–485*).—A brief practical account.

Coccidiosis of the chicken, W. T. Johnson (*Oregon Sta. Bul. 314 (1933), pp. 16, figs. 5*).—This is a practical account of coccidiosis of the fowl and means for its control in Oregon, where it is the most widespread infectious disease in specialized flocks, causing losses in both brooder and mature stock.

Studies on an uncomplicated coryza of the domestic fowl, I, II, J. B. Nelson (*Jour. Expt. Med., 58 (1933), No. 3, pp. 289–295; 297–304*).—This contribution is presented in two parts.

I. *The isolation of a bacillus which produces a nasal discharge.*—This is a report of studies of a form of coryza thought to be identical with the condition known as catarrhal roup in the older literature and later designated contagious catarrh. It is pointed out that a fowl coryza of this type has been recently studied in the Netherlands by De Blieck (E.S.R., 67, p. 170), who isolated a hemophilic bacillus from a blood agar plate streaked with nasal exudate from a naturally affected fowl. To this bacillus, which resembled the human influenza bacillus, he gave the name *Bacillus haemoglobinophilus coryza gallinarum*.

By a method combining filtration and cultivation, the author isolated an unidentified Gram-negative bacillus from the nasal exudate of fowl experimentally infected with an uncomplicated coryza. Isolation was accomplished by cultivation on sealed blood agar plates after unsuccessful attempts to produce colonies on open plates. Injection of the organism into the palatine cleft of normal birds was regularly followed by an inflammation of the nasal mucosa and a discharge from the nares. A parainfluenza bacillus which was also recovered from the nasal tract of affected fowl was innocuous. Certain cultural characters of the bacillus, bearing on its classification, are considered.

II. *The relation of the " bacillary " coryza to that produced by exudate.*—The intranasal injection into normal birds of exudate from natural cases resulted in the development of three types of an uncomplicated fowl coryza, differing in the onset and duration of symptoms.

" Protection tests were carried out with two of the types in an attempt to explain why the ' bacillary ' disease regularly ran a shorter course than the ' exudate ' disease. Reciprocal protection was demonstrated in one case, but in the other the birds which had recovered from the bacillary disease were susceptible to reinfection with exudate. There was no indication, however, that a second infectious agent was present in the exudate, and the failure to cross-immunize was ascribed, rather, to a reduction in the immunizing properties of the specific bacillus induced by artificial cultivation.

" It was also noted that the coryzas produced by exudate and bacilli, respectively, could be transmitted from infected birds to normal ones by direct contact. In both cases 1 bird out of 5 failed to contract coryza on exposure. These 2 birds were later injected with the respective agents to which they had been exposed and found to be resistant."

Fowl-plague in Egypt: Fowl-disease or fowl-plague of Newcastle Egyptian pseudo fowl-plague, M. Carpano, trans. by E. Talarewitch (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 129 (1933), pp. 20+[8], figs. 7*).—This is a summary of information on fowl plague as investigated by the author in Egypt.

Fowl pox (sorehead) control by vaccination, C. M. Bice (*Hawaii Sta. Circ. 8 (1933), pp. 13, figs. 5*).—This is a practical account of fowl pox control by vaccination, particularly through use of a strain of the fowl pox virus applied by the stick method, an earlier account of which work has been noted (E.S.R., 66, p. 373). This strain of vaccine was developed from lesions removed from chicks that had a natural outbreak of pox at 6 weeks of age. More than 150,000 chicks, varying in age from 4 to 12 weeks, have been vaccinated.

In experimental and field trials during 3½ yr. at the station vaccination of chicks ranging in age from 4 to 12 weeks was successful, the mortality being less than 5 percent. Turkey poults were successfully vaccinated from the third to the sixteenth week.

A list of 25 questions and answers regarding the disease and its control is appended.

Lymphomatosis, myelomatosis, and endothelioma of chickens caused by a filterable agent.—I, Transmission experiments, J. Furth (*Jour. Expt. Med., 58 (1933), No. 3, pp. 253–275, pls. 2, fig. 1*).—The author describes a new transmissible strain of leucosis of chickens that causes "(1) lyphomatosis with or without tumor formation and with or without leukemia, (2) myelocytomatosis with or without leukemia, and (3) endothelioma. All these diseases are transmissible by material free from viable cells, and the available evidence indicates that they are caused by a single filtrable agent."

A list is given of 23 references to the literature.

Some strains of Bacterium pullorum [trans. title], A. Rochaix and E. Couture (*Compt. Rend. Soc. Biol. [Paris], 114 (1933), No. 32, pp. 647–649*).—The biochemical and serological differences met with in strains of, and forms related to, *B. pullorum* are considered.

Pullorum disease (contagious white diarrhea) of poultry, W. T. JOHNSON and E. M. DICKINSON (*Oregon Sta. Bul. 313 (1933), pp. 18, figs. 4*).—This is a practical summary of information on pullorum disease and means for its control.

Clostridium botulinum, type C, associated with western duck disease, J. B. GUNNISON and G. E. COLEMAN (*Jour. Infect. Diseases, 51 (1932), No. 3, pp. 542–551*).—This is a report of a comparative study made of a strain of *C. botulinum*, type C, involved in duck disease with other strains of this type, the cultural, serologic, and toxicologic properties being determined and the relative toxicity of the various strains for ducks and chicks tested. The duck strain used was isolated from the liver of a duck suffering from duck disease. This strain, referred to as type Cα, was found to closely resemble other American strains of this organism in such properties.

Guinea pigs, mice, and rabbits were found to be highly susceptible to the toxin produced by this strain when the toxin is injected subcutaneously, but were relatively resistant to it when it was given by mouth. Mice were more resistant than guinea pigs to this toxin when it was given by mouth. Ducks were found to be susceptible to the toxins of type C orally administered. The strain of type Cβ isolated by Seddon (E.S.R., 48, pp. 181, 678) was found to be approximately ten times more toxic for ducks than the other strains. Chickens were found to possess a high degree of immunity to all the toxins of type C tested. The detoxified spores of the strain of *C. botulinum*, type Cα, isolated from a duck were harmful when fed to ducks in single doses up to 585,000,000.

The prevention and control of ulcerative enteritis in bob-white quail, L. C. MORLEY (*New England Poultryman and Northeast. Breeder, 17 (1933), Nos. 5, pp. 32, 44; 6, p. 49*).—A practical discussion of the present state of knowledge of this disease, a more extended discussion of which has been noted (E.S.R., 69, p. 864).

Studies on ulcerative enteritis in quail, J. E. SHILLINGER and L. C. MORLEY (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 1, pp. 25–35*).—This contribution, presented at the annual meeting of the American Veterinary Medical Association in August 1933, reviews the status of knowledge of this disease.

It is pointed out that due to the many unusual and seemingly contradictory results obtained in the study of the disease in quail and grouse, it is difficult to draw any conclusions relative to the nature of the etiological agent. The inability to develop or maintain strains of the organism of a high virulence under controlled conditions is baffling in the face of the often disastrous spread of the infection in flocks where it becomes epizootic. The only known control measures at present are those of breaking up flocks into as small groups as possible in widely separated locations and preventing spread of the infection by the usual hygienic procedures.

Examinations of bacteria of a canary bird necrosis [trans. title], E. KODENJA (*Vet. Arhiv, 3 (1933), No. 10, pp. 433–440; Eng. abs., pp. 439, 440*).—The author's work has led him to conclude that *B[acillus] septicaemiae hemorrhagicae*, form *B. canariense* of Migula, represents *B[acterium] pseudotuberculosis rodentium*.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the U.S. Department of Agriculture, 1933] (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. 79, 80, 84, 85*).—A brief account is given of the scope and progress of investigations in soil erosion control at 10 regional stations, in irrigation and drainage, and in cotton ginning and farm machinery.

[Agricultural engineering investigations in Colorado] (*Colorado Sta. Rpt. 1933, pp. 13, 19, 20*).—The progress results of investigations of light asphaltic road surfaces, measurement of water, water evaporation, and on the development of vortex-tube and riffle-deflector sand traps are briefly reported.

[Agricultural engineering investigations at the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 108, 199–212, fig. 1*).—The progress results are presented of studies of the pulling ability of horses, by E. T. Robbins and C. W. Crawford; rural electrification, by E. W. Lehmann and A. L. Young; sewage disposal, by Lehmann and A. M. Buswell; tractor lubrication and cost of tractor maintenance, by R. I. Shawl; plowing equipment for corn borer control, by Young and Shawl; terracing, by Lehmann and E. G. Johnson; grain harvesting, by Lehmann, Young, and Shawl; artificial hay curing and shrinkage of corn in cribs, by Lehmann, R. H. Reed, W. L. Burlison, and G. H. Dungan; and stationary spray plants, by Lehmann, Reed, H. W. Anderson, and R. L. McMunn.

The barrier system for control of floods in mountain streams, L. M. Winsor (*U.S. Dept. Agr., Misc. Pub. 165 (1933), pp. 24, figs. 12*).—This publication presents the results of 10 years of experiments conducted in cooperation with the Utah Experiment Station relating to the development of the barrier system of flood control.

It was found impracticable to construct channels which will carry away the debris brought down by torrential floods in mountain streams or the gravel flows that follow. It appears that any such channel will fill rapidly with detritus and overflow at the point where the grade changes from heavy to light.

The barrier system of flood and gravel control developed appears to have a broad range of application. The principles evolved are based upon natural laws and may be used wherever floods carry a heavy load of debris.

The success of the barrier system is dependent upon the amount of reasonably smooth surface over which the flood stream may spread before it reaches the stilling pool above the barrier. The lateral embankments merely define the limits of the depository. The wider they are apart the less the height needed to give protection against flood damage. If the flood is permitted to spread laterally over a broad surface there is less danger that the pool above the barrier will be filled with debris. The tendency of the successful barrier is toward complete unloading of the flood stream on the surface of the cone above the barrier where the lateral embankments are widely separated. Where the unloading process is complete, the fine sand and silt are dropped in the stilling pool. The natural channel will usually carry the water after the heavy detritus has been dropped.

An outstanding feature in the barrier system is the method by which a stream carrying a capacity load of sand, gravel, boulders, and mud may be used in building the lateral embankments and the barrier of a control basin where a natural site does not exist. The method may be used to build marginal embankments for control works at any section of an alluvial cone, even though the surface of the cone is higher than the natural ground on either side. This principle may be used also under some conditions in building levees along streams that overflow their banks because of the debris they transport to lower levels.

Separate roughness coefficients for channel bottom and sides, R. E. Horton (*Engin. News-Rec., 111 (1933), No. 22, pp. 652, 653, figs. 3*).—Data and a mathematical analysis are presented, indicating that when the bottom and the sides of an open channel are of different degrees of roughness the equivalent coefficient for the channel as a whole varies with the depth of flow. Formulas are presented which are considered to be a marked improvement over existing methods of determining values of *n* applicable to channels with two degrees of roughness.

Quality of irrigation waters (*Calif. Dept. Pub. Works, Div. Water Resources Bul. 40 (1933), pp. 95, pls. 3*).—This report of cooperative work conducted by the U.S.D.A. Bureau of Plant Industry and the California State Department of Public Works deals with the quality of irrigation waters in the south coastal basin. This basin includes the drainage basins of the Los Angeles, San Gabriel, and Santa Ana Rivers, and of the creeks that discharge directly into the Pacific Ocean in the vicinity of Santa Monica, as well as those discharging in the vicinity of Newport Bay.

The area contains approximately 2,460,000 acres. The waters in and near the basin were sampled at 1,711 locations, of which 1,433 represent wells, 107 surface streams, and 171 other sources. The total number of samples analyzed from all locations and assembled as the basis of this report was 4,447.

Considered as a whole, the irrigation supply of the basin was found to be of low salinity and well suited to irrigation use. This is especially true of the surface waters draining from the high mountains on the northern boundary. In certain limited areas the underground waters are of intermediate to high salinity, or contain boron in concentrations that are regarded as potentially harmful to the more sensitive crop plants.

Well-plugging program saves irrigation water (*Engin. News-Rec., 111 (1933), No. 20, pp. 598, 599*).—A description is given of a situation in the Roswell artesian basin in New Mexico where old leaky wells have been a constant source of water loss. Studies conducted cooperatively by the State engineer's office and the U.S. Geological Survey showed that many abandoned wells in the basin were permitting the artesian supply to leak into the upper strata. Basic data for well-plugging operations were developed which included the effective use of the deep-well current meter to explore leaky wells in the area. Studies indicated that the losses from the older wells ranged from a fraction of a second-foot to a probable maximum of 5 sec.-ft. per well.

In general, the plugging procedure finally employed is as follows: A 2-in. diameter pipe is placed into the well at the desired location and fluid mud is pumped into the well until the return fluid indicates a weight of about 12.5 lb. per gallon. A final pumping with heavy mud provides a temporary seal and support for cement grout. A neat cement grout is then injected into a pipe followed by sufficient heavy mud to clear the tube of cement. After the seal has been effected the top water is replaced with mud until the well is completely filled with clay. The data to date indicate that the cost of plugging the wells is less than the value of the water saved.

The economic design of wells and pumping plants, M. R. Lewis (*Agr. Engin., 14 (1933), No. 11, pp. 312–315, figs. 3*).—This is a contribution from the Oregon Experiment Station reporting the results of work done in cooperation with the U.S.D.A. Bureau of Agricultural Engineering. Technical data are presented on the design of wells and pumping plants for irrigation purposes, with particular reference to Oregon conditions. The paper represents chiefly an attempt to point out the ways in which theoretical studies may help in the actual design of pumping systems for drainage and irrigation, and to present typical results.

Land drainage in Britain, B. W. Adkin (*London: Estates Gazette Ltd., 1933, pp. XI+542, pl. [1], figs. 77*).—This is an extensive treatise on the principles and practice of land drainage in Great Britain. It contains chapters on the earth, the climate of Britain, springs, rivers, the improvement of rivers—prevention of floods, the improvement of rivers for navigation and milling, the velocity and discharge of rivers, the low-lying lands of Britain, methods of draining the lowlands, history and legislation affecting the drainage of the lowlands, agricultural drainage—history, necessity and methods, pipe drainage, mole drainage—irrigation, the law relating to agricultural drainage in England, and the law and practice of land drainage in Scotland. An appendix deals with legal phases of land drainage.

Improvements in the soil compactometer and notes on its performance, C. Davies (*Jour. Southeast. Agr. Col., Wye, Kent, No. 28 (1931), pp. 237–242, figs. 5*).—In this contribution from the South-Eastern Agricultural College, a description is given of improvements in an instrument used for measuring the degree of the consolidation of the soil under the influence of tillage and traction machinery. Tests with this apparatus led to the conclusion that the shapes of all cutting edges and piercing points can be designed in a way conducive to the least expenditure of energy for the work to be done. Further work is to be conducted with plowshares, colters, tines, digging forks, mole plows, and similar soil-working tools.

Soil heating—a load builder, G. A. Reitz (*Elect. World, 102 (1933), No. 24, pp. 762–764, figs. 4*).—A brief description is given of several different experiments on the use of electricity for the heating of greenhouse and hotbed soils.

Report of the Chief of the Bureau of Public Roads, 1933 (*U.S. Dept. Agr., Bur. Pub. Roads Rpt., 1933, pp. 46*).—In addition to data on the status of Federal-aid and other road-construction activities of the bureau for the year, this report presents the progress results of traffic surveys, tests of highway signs, taxation, studies of rolled concrete pavements, concrete from central mixing plants, grading studies, concrete pavement design, and subgrades.

Public Roads, [December 1933] (*U.S. Dept. Agr., Public Roads, 14 (1933), No. 10, pp. 181–196+[2], figs. 15*).—This number of this periodical contains the current status of U.S. Public Works road construction as of November 30, 1933, and the following articles: Laboratory Tests Assist in the Selection of Materials Suitable for Use in Mud Jack Operations, by A. M. Wintermyer (pp. 181–184, 194); Analytical Tools for Judging Results of Structural Tests of Concrete Pavements, by H. M. Westergaard (pp. 185–188); and An Improved Recording Strain Gage, by L. W. Teller (pp. 189–194).

Shear strength of resistance welds, G. A. Hughes (*Elect. World, 102 (1933), No. 20, pp. 634–636, figs. 7*).—Results of shear strength tests of structural steel and structural members joined by projection welding, spot welding, and flash or butt welding are reported. The lowest shear value obtained for the welds was 36,600 and the highest value 58,100 lb. per square inch. This discrepancy is believed to be due to error in measuring the weld areas and because of elongation of the welds in failure. However, the welds were stronger than the web members. Flash welds were always somewhat stronger in shear than spot welds.

Plastering and moisture in woodwork, L. V. Teesdale (*Amer. Builder and Bldg. Age, 55 (1933), No. 8, pp. 37, 55, fig. 1*).—In a brief contribution from the U.S.D.A. Forest Products Laboratory, results of tests are summarized indicating the moisture content of various lumber items during the construction period.

It has been found that during the plastering operation most of the large amount of water brought into the building under construction evaporates directly into the air, but that some is absorbed by the studs, joists, and other wood members. When drying is completed the plaster is actually drier than the wood, and it has been found that the moisture content of the wood items rather than that of the plaster should be used as a criterion for determining when it is safe to install the interior finish.

Physical and chemical examination of paints, varnishes, lacquers, and colors, H. A. Gardner (*Washington, D.C.: Inst. Paint and Varnish Res., 1933, 6. ed., pp. 1174+A350+[16], [pl. 1], figs. 393*).—This is the sixth edition of this handbook. It contains chapters on hiding power and brightness; tinting strength of white pigments; tone and strength of colored pigments; ultraviolet studies on pigments and liquids; color systems; color standards for liquids and resins; preparation of films; drying time; hardness, abrasion, and adhesion; gloss measurements; exposure tests; accelerated weathering tests; temperature and humidity control; miscellaneous tests; oil absorption of pigments; consistency determinations; surface and interfacial tension; specific gravity determinations; particle size; examination of oils, driers, thinners, resins, shellac, paint, and varnishes; bituminous paints and baking enamels; examination of waxes; raw materials for cellulosic coatings; physical tests on cellulosic coatings; analysis of cellulosic coatings; and specifications.

Alcohol as a possible source of motor fuel, A. L. Teodoro (*Sugar News, 14 (1933), No. 2, pp. 81–83*).—In a brief contribution from the department of agricultural engineering of the University of the Philippines, results of tests of the use of alcohol as motor fuel are briefly summarized.

The operation of gasoline engines on alcohol was smooth and silent and devoid of fuel knock. Alcohol could be used with very high compressions, and at high compressions the fuel consumption decreased and the power output increased. Crankcase oil dilution was less with alcohol fuels than with hydrocarbon fuels. On the other hand, at the same compression ratio the consumption of alcohol was greater per unit of power output than with hydrocarbon fuels, and starting was difficult at a compression ratio best suited for gasoline.

Data are also presented on the use of alcohol in engines designed for kerosene. The results were not so favorable as those secured with gasoline engines.

Czechoslovakian alcohol-benzol mixtures [trans. title], A. Balada (*Chem. Obzor, 7 (1932), No. 11, pp. 240–244, fig. 1*).—Studies are reported which showed that when benzol is mixed with alcohol there is an increase in the mixture volume accompanied by a decrease in temperature. The characteristic qualities of the benzol are changed considerably by the addition of alcohol, which fact must be considered in evaluating the mixture as a motor fuel. This is especially important with reference to the starting capacity of mixtures at the 10 percent point. Heavy benzols, the 10 percent point of which decreased after adding alcohol even below the 10 percent point of the representative light benzol from the same raw material, did not start better than the latter. Data are also included on values of octane numbers of Czechoslovakian benzol and benzol mixtures.

Vegetable oils as internal-combustion engine fuel [trans. title], A. W. Schmidt (*Tropenpflanzer, 35 (1932), No. 9, pp. 386–389*).—In a brief contribution from the Technical Academy of Breslau, experiments are reported which showed that vegetable oils are heavy and suitable for use only in Diesel and semi-Diesel engines, and in their natural condition were unsatisfactory for tractor engines designed for gasoline or benzol fuels. Tests with peanut, soybean, and palm oils in a small Diesel engine showed that the engine ran satisfactorily, and although some difficulty was sometimes experienced with starting, this was overcome by starting on such a mineral fuel as benzol. The power output of the engine was considerably less with vegetable oils than with mineral fuels, being in the ratio of 15:24. This was found to be due partly to the lower calorific value of the oil and also to the improper atomization and imperfect combustion resulting from higher viscosity.

Nebraska tractor tests, 1920–1933 (*Nebraska Sta. Bul. 285 (1934), pp. 32, fig. 1*).—This bulletin summarizes the results of 80 tractor tests, and includes data on all tractors reported by their manufacturers as on the market January 1, 1934.

Spray machines and equipment, F. GODBOUT (*Quebec Dept. Agr. Bul. 124 (1933), pp. 1–7, figs. 7*).—Descriptions and illustrations are given of power sprayers and their accessories.

A comparison of various harvesting methods in respect to moisture and grade of the grain, R. K. LARMOUR, W. F. GEDDES, and D. CAMERON (*Canad. Jour. Res., 9 (1933), No. 5, pp. 486–501, fig. 1*).—The work on which this report is based was conducted cooperatively by the Universities of Manitoba, Saskatchewan, and Alberta.

In a moisture and grade survey of grain harvested by various methods in western Canada during the 1932–33 season, straight-combined wheat showed a greater percentage of tough and damp samples than either stook-threshed or swath-combined samples. As a result of exposure to rains, the average grade lowering was least for stooked grain and greatest for swath-combined grain.

Artificial drying of rice on the farm, W. D. SMITH, J. J. DEFFES, C. H. BENNETT, W. M. HURST, and W. H. REDIT (*U.S. Dept. Agr. Circ. 292 (1933), pp. 24, figs. 13*).—Investigations conducted by the U.S.D.A. Bureaus of Agricultural Engineering and Agricultural Economics are reported.

The results show that the method of combine harvesting and artificial drying, if properly carried out, eliminates damage to the rice from unfavorable weather, reduces loss from shattering, and produces rice of higher milling quality and a more uniform product than does the common method of harvesting with a binder. Tests made with both experimental and commercial grain driers show that in order to obtain rice of a high milling quality a much lower drying-air temperature must be used than is customary in drying other cereals. If a drying-air temperature as high as 120° F. is used, the moisture content of rice should not be reduced more than about 2 percent at any one drying operation, unless that content is considerably in excess of 20 percent. If sufficient bin space is not available for storing the rice between drying operations, or if for other reasons it is necessary to dry the rice in one operation, the drying-air temperature should not exceed 110° for best results.

Artificially dried rice should remain in storage for a few days before it is milled or sampled for official grading. Rice harvested with a combine should usually be cleaned before drying. Small lots of rice should be consolidated whenever possible, as bin space, fuel, and labor can be conserved in drying large lots and in keeping the drier in continuous operation.

Commercial driers will usually do the work for which they are designed without changes or alterations on the part of the operator. Under ordinary conditions no attempt should be made to increase the quantity of air supplied by a fan, as the increase in the power requirements may offset any gain in rate of drying. In some driers, however, the rice may funnel, causing uneven drying. This trouble can usually be rectified on some driers by changing the position of supporting members for the shut-off valves between the drier and cooler and between the cooler and discharge hopper.

Electric heat for curing and storing of sweet potatoes, E. T. SWINK (*Agr. Engin., 14 (1933), No. 11, pp. 305, 306*).—Experiments conducted from the commercial standpoint are briefly reported, in which a curing house 14 by 18 ft. was tested, its capacity being approximately 700 bu. of potatoes stored in crates. Heaters were connected in series groups of four and were operated on 240 v, each heater having an output of about 440 w. Although the losses were high due to overheating at the bottom, the heaters operated satisfactorily. On the basis of these findings, three other houses were operated, including one built of cinder blocks. The results obtained with the cinder block house were very satisfactory, the loss being only 2 percent. The house of wood construction was finally equipped so that losses due to faulty curing or storage were completely eliminated. It was found that the use of a 12-in. air space under the potatoes will prevent overheating.

The conclusion is drawn that in localities where winters are severe an arrangement using a stove located outside the potato house proper in conjunction with electric heat will give good results.

The pasteurization of milk by an electric current, C. G. KING (*Electrochem. Soc. Trans., 62 (1932), pp. 233–236, fig. 1*).—This is a brief account of the experience of 17 commercial institutions on the electric internal heating of milk for pasteurization. Alternating current is passed through the milk, and the entire mass of fluid is easily and evenly heated with a minimum of exposure to either air or metals. Water-cooled carbon plate electrodes are used, and the temperature is brought up in two stages—first to 120° F. and then to 162°. It is stated that the pasteurized milk produced has been given repeated satisfactory tests as to efficiency in destroying pathogenic organisms.

Electrically heated dairy utensil sterilizers, J. E. NICHOLAS, J. A. SPERRY, and L. F. TOMEY (*Pennsylvania Sta. Bul. 296 (1933), pp. 28, figs. 15*).—Part 1 of this bulletin reports studies of the comparative heating efficiency of different types of sterilizers, and part 2 reports studies of the bacteriological efficiency of electrically heated dairy utensil sterilizers.

It was found that electrically heated dairy utensil sterilizers are mechanically efficient and economical of operation and meet the requirements of the Pennsylvania Department of Health. The cost of the operation of the electrically heated sterilizer depends on the weight in pounds of the utensils, the quantity of water used, the initial and the final temperatures of the water and the utensils, the heat losses, the time of the season, the size of the heat elements (watts), and the heat capacity of the sterilizer. The heating and sterilizing operations are automatic. There are no open fires, soot, or smoke. The sterilized utensils may remain in the sterilizer until needed.

It was also found that the hot water sterilizer is a good safeguard against the careless washing of milk bottles and dairy utensils on farms having a capacity of 200 bottles a day or less. This sterilizer, however, fails to serve its purpose with any degree of certainty when the temperature of the water falls below 180° F. during the process of sterilization. The utensil temperature range for *Escherichia coli* is 160° to 203°. A few tests indicate that the utensil temperature for the destruction of *Bacillus subtilis* is 325°, using the humidified hot air sterilizer. When operated at the proper temperature, the hot water sterilizer is an excellent apparatus for producing bacteriologically clean dairy utensils.

It is not considered feasible to recommend any definite temperature for the hot air sterilizer. It is considered more advisable to suggest that the destruction of bacteria, except the high-heat-resisting, spore-forming *B. subtilis*, is satisfactorily accomplished after all the moisture from the wet utensils which have been placed in the sterilizer has evaporated. Experience indicated that with this as a guide, utensils may be considered bacteriologically clean and are frequently even sterile.

The characteristics of electric hot air dairy utensil sterilizers, J. E. NICHOLAS (*State College: Penn. State Col., 1933, pp. 15, figs. 9*).—In this contribution from the Pennsylvania Experiment Station laboratory tests are reported indicating that the electric hot air sterilizer offers a satisfactory solution to the problem of farm dairy utensil sterilization. The opinion is expressed that an electric dry heat sterilizer can be constructed which should have small heat capacity and ample air space for insulation and light construction consistent with durability. Aluminum foil was found to show promise as an insulator. It was also found that the heating elements should be equally spaced over the entire bottom and protected by a screen of such small mesh as to break up drippings from the washed utensils. The heating elements should be so arranged that if the utensils produce an unusually large amount of drip water it will collect in a low spot without coming into contact with any heating element. Vent holes should be provided in the top to facilitate the escape of evaporated moisture, and in the bottom symmetrically with those in the top to permit the escape of cold air during the first part of the sterilizing process. The upper section of the sterilizer should be hemispherical, or at least shaped in the form of an arch to avoid dead cold spots.

Utility refrigerators for farm use, J. R. Tavernetti (*Agr. Engin., 14 (1933), No. 11, pp. 302–304, fig. 1*).—In a brief contribution from the California Experiment Station, a description is given of utility refrigerators developed for use on farms where storages up to 100 cu. ft. are required. A theoretical discussion is given of the problems involved in the design and construction of such utility refrigerators, and an illustration is given of the use that may be made of one on a farm.

The disposition of drainage water from milking barns, H. B. Walker and H. L. Belton (*Agr. Engin., 14 (1933), No. 11, pp. 309–311, figs. 2*).—In a contribution from the California Experiment Station, results of a series of experiments are briefly reported, the purpose of which was to secure data for the design of suitable tanks to separate the solid and liquid wastes so that final disposal might be accomplished with less likelihood of creating nuisances. In these tests an effluent of 11 gal. per cow per milking was used, having 15,000 p.p.m. of waste. Tests were made with effluent rates of 10 and 18 gal. per minute and for volumes equivalent to 20- and 50-cow herds.

It was found possible to make effective use of screen chambers to separate solids from the liquid wastes from dairy barns, and that shallow, easily cleaned chambers were practicable. It usually required about one hour for the screen chamber to drain after barn cleaning. The screens, which were made of hardware cloth supported by suitable frames, were held in place by wall slots. After drainage these were withdrawn, and when struck flatly on the side of the tank with the upstream face downward the impinged fibrous covering fell to the tank floor and the screen was left clean. Floor baffles were likewise made removable, so that the shallow tank floor could be quickly cleaned with a shovel like a regular barn gutter. The solids were shoveled into a wheelbarrow or other container and placed in storage with other solids as manure.

Technical data are given on the design of screen chambers. Chemical methods of precipitation were tested to clarify the effluent from screen chambers, special attention being given to ferric sulfate. This quickly produced a relatively clear liquid which was readily absorbed by the soil.

Removal of soot from furnaces and flues by the use of salts or compounds, P. Nicholls and C. W. Staples (*U.S. Dept. Com., Bur. Mines Bul. 360 (1932), pp. IV+76, figs. 18*).—This bulletin reports a series of tests and studies, made mainly in the laboratory. They included a study in small-scale laboratory set-ups of soot deposits placed in gas streams; tests of a domestic cookstove and a domestic heating boiler burning coal; tests to determine whether application of a salt or compound with each firing of a furnace would reduce the smoke, lower the amount of soot deposited, or appreciably improve the efficiency of the heater; tests of heating boilers and hot-air furnaces installed in houses and other buildings in which the investigators tried to remove the accumulation of soot in the flues and chimneys, using salts or other compounds; and tests in which the householders used the salts or compounds in their furnaces at frequent intervals but otherwise operated them in the usual manner.

It was found that the action of soot destroyers is to form a fume when thrown on the fire which deposits on the soot and enables it to ignite at a lower temperature and to burn more readily than untreated soot. This action is restricted to metallic salts or those formed by the burning of metals. The chlorides of metals vaporize more readily, and were also found to give deposits which were more effective. Tabular data are given in this connection covering 59 different compounds, of which zinc dust, antimony filings, aluminum filings, sodium fluoride, saltpeter, common salt, and lead rate the highest, followed by the compounds of other metals, including those of calcium, manganese, copper, and tin.

The presence of oxygen in the furnace gases was found necessary for a soot remover to be effective, and the process is limited to that of oxidation. If the soot is ignited the removal is shown by visible burning, but slow oxidation without visible burning occurs with both treated and untreated soot. The rate of such action decreases rapidly as the temperature of the gases decreases below the temperature of ignition, until a temperature is reached below which no oxidation occurs with long exposure.

The effectiveness of salts or compounds when used with household stoves or heaters was found to be a matter of chance to a large extent. It was dependent on the type of stove, the chimney draft, the quantity of soot formed, and the adjustment of dampers.

Only moderate success was obtained with a cookstove because of the difficulty of burning the fuel fast enough to raise the gases to a high temperature. Good but rather uncertain success was obtained with household heaters. It was better as the deposit of soot was thicker. The action extended further in warm-air furnaces. In no installation did burning of the soot in the chimney occur with heating boilers. The burning of a small amount of wood and paper after the treatment insured more thorough burning of the soot.

Treatment of the coal did not decrease the smoke or soot given off from the fuel bed or prevent the formation of soot. Regular treatment, however, gave the soot a better chance to burn in normal operation. This action depended on the occurrence of high temperatures occasionally, and no improvement resulted if this did not happen.

All of the proprietary and commercial compounds tested contained some ingredients which were found to be effective, but the majority also contained other ingredients for which no usefulness could be assigned. Tests of these compounds in furnaces in the laboratory and in dwellings showed that their effectiveness corresponded to those which could be predicted from their analyses, and also showed that no one of them was as effective as certain salts and other mixtures.

Heat transmission, W. H. McAdams (*New York and London: McGraw-Hill Book Co., 1933, pp. IX+383, figs. 127*).—This is a handbook for practicing engineers containing chapters on conduction, heating and cooling of solids, radiation of heat, dimensional analysis, flow of fluids, introduction to convection, fluids inside pipes, fluids outside pipes, condensing vapors, and heat transfer to boiling liquids.

Air conditioning, J. A. Moyer and R. U. Fittz (*New York and London: McGraw-Hill Book Co., 1933, pp. VIII+390, figs.* [203]).—This book contains chapters on air-conditioning principles, ventilation requirements, air filtration, cooling methods, refrigeration for air conditioning, properties of refrigerants, types of refrigerating equipment for air conditioning, temperature- and humidity-control equipment, design of temperature- and humidity-control systems, fans and auxiliary equipment, office buildings, theaters, restaurants, food factories and textile mills, railroad passenger cars, air conditioning for residences, and residence heating with refrigeration equipment.

Cooling and air conditioning for comfort, W. GOODMAN (*Chicago: Aerologist Pub. Co., 1932, pp. 93, figs. 8*).—This pamphlet relates to the theory and calculations of the subject and comprises an intricate mathematical analysis. An appendix includes tabular and graphic data.

AGRICULTURAL ECONOMICS

Report of the Chief of the Bureau of Agricultural Economics, 1933 (*U.S. Dept. Agr., Bur. Agr. Econ. Rpt., 1933, pp. 24*).—The work of the Bureau is discussed, and data noted as to the use of American tobacco in Europe, the demand for American cotton in Japan, research in price analysis, farm credit, farm taxation, farmers' incomes, type of farming, and cost of production, farm population, and different phases of the marketing of cotton and the adaptation of cotton to new uses.

[Investigations in agricultural economics and farm management at the Illinois Station, 1932–33] (*Illinois Sta. Rpt. 1933, pp. 98–105, 122, 123, 164–198, 221, figs. 7*).—Results not previously noted for the following investigations are reported: The contract or partnership agreement plan of operation for small livestock shipping associations, by R. C. Ashby (pp. 98, 99); the accuracy of farm scales, by Ashby (pp. 99–101); the effects of decentralization of livestock markets on returns in the industry, by Ashby and H. P. Rusk (pp. 101–105); marketing of cream, by C. A. Brown (pp. 122, 123); farm management findings by H. C. M. Case and M. L. Mosher for 1929–31 for 280 farms in Livingston, McLean, Tazewell, and Woodford Counties (pp. 164–167); findings by R. R. Hudelson, P. E. Johnston, Case, and L. Wright as to the farm earnings in 1932 including 1,314 farms (pp. 167–178); findings by R. H. Wilcox, Case, and E. L. Sauer as to costs in growing and harvesting corn in 1926–32 in Champaign and Piatt Counties (pp. 178, 179); the average income per acre from soybeans, 1932, and for the periods 1923–32, 1928–32, and 1930–32, with comparisons with income from corn, wheat, and oats, by R. C. Ross (pp. 179, 180); tables with discussions, by Case and K. H. Myers showing the computed earnings of all farms, by years 1924–32, in each of the 8 type-of-farming areas of the State (pp. 180–182); man labor, horse, and machinery costs per acre in 1930 and 1931 on horse, standard-tractor, and general-purpose tractor farms, by Johnston (pp. 182–184); changes in grain harvesting charges, 1929 to 1932, by Ross (p. 185); receipts and expenses in 1932 for 30 poultry flocks, by Wilcox and L. E. Card (p. 186); average investment and income in 1932 on 17 fruit and 7 vegetable farms, by Case, Johnston, and V. W. Kelley (p. 187); production, prices, and exports of soybeans, and production, costs of production, and prices of redtop in 1932 compared with 1931, by C. L. Stewart and W. L. Burlison (pp. 187–189); tables and charts, by L. J. Norton, showing the average prices of selected Illinois farm products, 1910–14, 1921–29, 1932, and January to March 1933, and the relation, 1919–32, of the indexes of wholesale prices of all commodities and Illinois farm products prices, and of production of agricultural and industrial products (pp. 189–191); changes in the value of farm lands and farm buildings, March 1, 1930, to March 1, 1933, and in cash rents for farm lands, 1929–30 to 1933, by Stewart (pp. 192, 193); the variations in prices of hogs in 1932 between the Chicago and East St. Louis markets, by Norton and Ashby (pp. 193, 194); changes, 1929–32, in milk consumption in St. Louis, average handling margins on milk in 38 United States cities, and milk sales in the United States, by R. W. Bartlett and Brown (pp. 194–196); data regarding per acre first mortgage debt on farms in 4 Illinois counties in 1932, use of the facilities of small loan companies by farmers in 6 counties, and other phases of the farmers' debt problem, by Norton (pp. 196–198); and data regarding the movements of Calhoun County apples by different transportation agencies, 1927–32, by J. W. Lloyd and H. M. Newell (p. 221).

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 165 (1933), pp. 152–154*).—Included are an article by H. R. Moore, Probable Cost to Ohio Farmers of a General Sales Tax (pp. 152, 153) and a continuation (p. 154) of the Index Numbers of Production, Prices, and Income, by J. I. Falconer (E.S.R., 70, p. 114).

[The agricultural situation, 1933] (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. 1–67, figs. 2*).—This report discusses and presents the agricultural situation under the following headings: The dilemma of the surpluses, agricultural adjustment legislation, farmers and national recovery plans, coordinating the A.A.A. [Agricultural Adjustment Administration] and the N.R.A. [National Recovery Act], farm relief and the consumer, farmers and unemployment relief, permanent control of agricultural production, science in production and in distribution, cotton-acreage reduction, wheat-acreage reduction, emergency hog program, dairy-industry adjustments, reducing tobacco production, fruit and vegetable agreements, speculation in commodities, farm income from 1933 production, farm real estate values, farm debts, farm taxes, and extension and information work.

The agricultural outlook for 1934 (*U.S. Dept. Agr., Misc. Pub. 182 (1933), pp. 110*).—This report, which continues the series previously noted (E.S.R., 69, p. 131) and replaces the series of reports for the Southern States (E.S.R., 64, p. 567), was prepared by the staff of the Bureau of Agricultural Economics, assisted by representatives of the Agricultural Adjustment Administration, the Extension Service, and the State agricultural colleges and extension services. It "summarizes facts not readily available to farmers and indicates the probable trends of production, distribution, and markets, so far as it seems feasible to indicate such trends at the present time." Domestic and foreign demands, agricultural credit, farm labor, equipment and fertilizers, farm family living, and the outlook during 1934 for acreage, production, prices, etc., for different crops and for different kinds of livestock and livestock products, are dealt with.

Profitable systems of farming for the Idaho Falls area, P. A. EKE and N. W. JOHNSON (*Idaho Sta. Bul. 198 (1933), pp. 65, fig. 1*).—This study was made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., to determine the enterprises and the forms of farm organization best adapted to the area and to obtain information for developing and adjusting farm plans. Five 7-yr. and two 6-yr. rotations for an 80-acre farm, including alfalfa, potatoes, sugar beets, peas, and wheat, and the feasibility of adding a 14-cow dairy, a farm flock of 124 ewes, or a 3-sow hog unit with the 3-yr. alfalfa, 2-yr. potato, 1-yr. sugar beet, 1-yr. wheat rotation are considered. Data were gathered in 1931 through interviews with graders regarding the amount and distribution of labor on different crops, expenditures for labor, materials, supplies, water, taxes, etc., with implement dealers regarding cost of implements, and with local agencies regarding prices of crops other than potatoes (potato prices from U.S. Department of Agriculture reports). Comparisons are made of the average (1925–30) and the 1931 capital investment, receipts, expenses, farm income, and labor income with the different crop rotations, together with a table showing the effects of changes in prices of crops and costs of labor on the receipts and expenses. Similar comparison is made for the individual years for a farm under the general farming system. The effect on income of size of business in years of favorable and unfavorable potato prices and of raising enough dairy cattle to consume hay, pasture, and byproducts, or enough dairy cattle or sheep to consume hay, pasture, and forage, or enough hogs to consume the grain, or with range ewes wintered on the farm, thus affording a sale for surplus hay and forage, are shown in tables.

The budgeting of the farm business is illustrated, and the ways of maintaining soil fertility under the different farming systems are discussed.

A farm management study of crop production practices, P. G. Minneman and E. B. Hill (*Michigan Sta. Spec. Bul. 241* (*1933*), *pp. 58, figs. 19*).—This study, made in cooperation with the U.S.D.A. Bureau of Agricultural Economics, of the labor, power, equipment, and materials used in crop production in southeastern Michigan is based on records from 123 of the more outstanding farms in 1930 and 105 farms in 1931 in 5 counties. The area, types of farming, labor, power, and equipment by size of farms, etc., are described. Analysis is made of the labor, horse, and tractor requirements; the costs, seasonal labor distribution, costs of materials, other cash expenditures, etc., in different operations in plowing; preparing the seed bed and planting, cultivating, spraying, etc., up to harvest; and the harvesting costs with different crops, farm practices, equipment, etc. Methods of applying the findings to individual farms are illustrated.

Some of the general findings were as follows: (1) More home-grown feed, power, and fertilizer are being used by farmers to reduce costs; (2) labor costs may be effectively reduced by the use of larger teams and tractors; (3) except when corn stover is to be turned under or weeds threaten, it may be more economical to sow small grains without plowing; (4) timeliness in planting and the proper amount of seed aided in economical production; (5) the use of improved seed, commercial fertilizer, and green and barnyard manure increased crop yields 30 percent; (6) weeders, rotary hoes, and general-purpose tractors for corn speeded up cultivation and released men and horses for hay making; and (7) the advantages of using larger, newer, and more expensive machines may be obtained through cooperative ownership or custom work.

Farm reorganization and management in east central North Dakota, H. R. Danielson and R. S. Kifer (*North Dakota Sta. Bul. 273* (*1933*), *pp. 95, figs. 22*).—The purpose of this study, made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., was "to bring to a number of farmers the available information on economic conditions, farming trends, and improved practices of handling crops and livestock, to study the adjustments the farmers were able to make in their farming business, and to show desirable systems of farming in the area." Inventories, records of receipts, expenditures, crop and livestock production, location of crops, etc., and estimates of labor requirements for different crops were obtained from 35 farmers in 1930 and 1931, and 36 farmers in 1932, in 4 counties. The soil, climate, and land use, the changes in prices from 1910 to 1930, the adjustments in production from 1919 to 1931, the farming conditions from 1930 to 1932 in the area, and the financial condition of 35 farms in 1932 are described. Analysis is made of the farm earnings on the farms studied from 1930 to 1932, inclusive, and of the methods used in crop and livestock production. The organization, plans for reorganization, and returns of 6 of the farms are analyzed and discussed in detail.

Present land uses—Washington.—Types of farming series, I, R. E. Willard and N. W. Johnson (*Washington Col. Sta. Bul. 288* (*1933*), *pp. 40, figs. 9*).—This is the first of a series of bulletins prepared in cooperation with the

U.S.D.A. Bureau of Agricultural Economics. It consists of tables and maps, with explanatory text, showing by counties the lands used for irrigated and nonirrigated farming, national forests, and other uses; topography; precipitation and frost-free seasons; soils; area of land in farms and proportion of such area in cultivation and in pasture; and the location of farms.

Costs and returns in producing potatoes in New York in 1929, F. L Underwood ([*New York*] *Cornell Sta. Bul. 568* (*1933*), *pp. 122, figs. 2*).—Records of farm business and of detailed costs and returns of the potato enterprise were obtained by the survey method from 129 western New York (Genesee and Monroe Counties, a general farming region), 103 Steuben County (a general farming area), 47 northern New York (Clinton and Franklin Counties, a dairy region), and 112 Long Island (an intensive cash crop region) farms. The potato enterprise records covered the period from the first preparation for the 1929 crop through the entire disposal of the crop. The data on livestock and crops other than potatoes covered the year ended March 31, 1930. The farming systems, receipts, expenses, profits, etc., of each area are described. Analysis is made for each area of the different costs in growing, harvesting, storing, and marketing potatoes; the returns, profits, and the factors affecting costs and returns and yields in producing potatoes; and other factors affecting labor income on the farms studied. The findings for the four areas are summarized as follows:

Western New York area: In general, the farmers making the highest labor incomes had profitable potato enterprises combined with other profitable crops and high-producing livestock. They had relatively large businesses, used labor more efficiently than the average, produced relatively large acreages of potatoes on good soils, and followed to a greater extent than the average the practices of spraying, fertilizing, and using good quality seed. Their costs were low and their returns high as compared with the average.

Steuben County: The highest labor incomes were made by the farmers who had relatively large acreages of potatoes and secured good yields of potatoes by using relatively large quantities of seed and fertilizer and by efficient spraying and dusting. Their labor incomes were increased by having profitable dairy enterprises. Commercial dairying was not advisable if milk sales per cow were low. Large businesses with high rates of production and efficiency in the use of labor were the most profitable.

Northern New York: The highest labor incomes were made with high producing cows, profitable potato enterprises, and businesses large enough to keep the available labor profitably employed.

Long Island: Due to the unfavorable season, relatively large businesses were no more profitable than small ones. Farmers who had more than the average acreage of potatoes and yields above the average, due to the use of relatively large amounts of seed, fertilizer, and spray, produced potatoes at lower average costs per bushel, received higher average returns per hour of labor on potatoes, and had relatively high labor incomes, even in a poor year.

Costs and returns in producing apples in the Newfane-Olcott area, Niagara County, New York, 1926 to 1928, T. E. La Mont ([*New York*] *Cornell Sta. Bul. 565* (*1933*), *pp. 87, figs. 14*).—This bulletin is based on from 175 to 179 cost production records obtained from 136 to 162 farmers for the years 1926 to 1928, inclusive, supplemented by labor income records for the years since 1928, and data for the period studied and earlier years included in publications of the U.S. Department of Agriculture and other publications of the station. The climate, soils, transportation facilities, and local markets; average size of farm, capital investment, number of livestock, receipts, expenses, etc., per farm in 1928; and the labor incomes, 1913–30, are discussed. Detailed analyses were made of yields and production, the costs of human, horse, and tractor work, cultivating, spraying, dusting, pruning, manuring, fertilizing, picking, packing, and marketing, and for interest, taxes, depreciation, etc. In making the analyses the orchards were grouped by size, soil types, age of trees, etc. The effects of yields, age and size of trees, and size and condition of orchards are discussed.

The average labor income of farmers, 1913–30, was $451 on Dunkirk soils (usually well drained) and —$24 on Clyde soils (usually poorly drained). On the well-drained soils the large farms obtained the highest average labor incomes. On poorly-drained soils the incomes of the large farms were the smaller.

Average yields and costs of production per barrel for orchards set before 1930 were 46 bbl. and $2.17 on Dunkirk loam soils, 31 bbl. and $2.93 on Clyde loam soils, and 21 bbl. and $3.55 on Clyde clay loam soils. Man labor made up 42 percent and interest on orchard 19 percent of the cost of production. Where horses were used the average costs per acre of plowing orchards were $4.72, disking $1.34, and harrowing once $1.24. With tractors these costs were $2.81, 91 ct., and 80 ct., respectively. The average costs per application of dusting were $4.90 and of spraying $5.59. The average net costs of pruning were $17.70 per acre for orchards set before 1900 and $7.12 for those set after 1900. The average cost of packing at custom packing houses decreased from 30 ct. per barrel in 1926 to 22 ct. in 1928. The cost of packing on farms decreased from 34 ct. where less than 75 bbl. were packed to 23 ct. where more than 175 bbl. were packed. The average costs of hauling and marketing were 21 ct. per barrel in 1927 and 20 ct. in 1928.

The average yields for orchards with less than 30 places per acre for trees were 32 percent greater than where there were 40 or more places per acre.

Some factors of success in cattle ranch management, western South Dakota, C. M. Hampson (*South Dakota Sta. Circ. 13 (1933), pp. [2]+13*).—This is a mimeographed preliminary report covering the year ended October 31, 1932, made as a continuation of the study previously noted (E.S.R., 65, p. 187). It is based upon the records from the 16 of the 22 cooperating ranches which did not derive a considerable portion of their income from other sources than the ranch.

Tables show for each ranch the net earnings, cash and noncash receipts, cash expenses by items, noncash expenses, receipts and expenses per cattle unit, amount and distribution of capital investment, and number of man units and cattle units per ranch and per man.

Cattle production on Wyoming's mountain valley ranches, A. F. Vass and H. Pearson (*Wyoming Sta. Bul. 197 (1933), pp. 125, figs. 28*).—This second bulletin (E.S.R., 56, p. 183) dealing with the production of cattle in Wyoming analyzes detailed records from 47 mountain valley ranches obtained by a survey made in 1926 with a view of determining the effects of different systems of management on costs of production per animal unit and the factors influencing losses and gains. Return on investment is used as the measure of success of management. The climate, topography, vegetation, and transportation facilities of the area are described. The distribution of ranch investment; land utilization, tenure, and taxation; financing; receipts and expenses; cattle units based on feed, labor, and investment costs; management practices on mountain valley ranches; and age for and method of marketing cattle are discussed. A standard ranch organization is outlined.

Tables are included and discussed showing (1) the average carrying cost per cattle unit for labor for different purposes, feed bought, leases and fees, taxes, automobile, machinery and building repairs and depreciation, unpaid labor, manager, interest paid and allowed, death losses, bull service, depreciation, and miscellaneous expenses; (2) the annual carrying costs of different classes of cattle; and (3) weights, gains, cost per pound, and selling prices of steers and heifers of different ages. Correlation analysis is made of the relation to rate of return on investment of percentage of investment in cattle, percentage of calf crop, number of cattle units handled per man, tons of hay fed per cattle unit, number of cattle units per ranch, production of beef per cattle unit, income per cattle unit, and expenses per cattle unit.

There was an average of 628 cattle units per ranch. The average ranch investment for the 47 ranches was $95,129. Total operating expenses averaged $23.81 per cattle unit, which with death loss, bull service, and depreciation brought the carrying cost per breeding cow to $26.65. The annual carrying costs for steers were for yearlings $15.35, 2-year-olds $19.92, and 3-year-olds $25.20, and for heifers for yearlings $15.29 and 2-year-olds $22.52. On the basis of gains and carrying charges, the costs per 100 lb. were for steer calves $10.32, yearlings $8.63, 2-year-olds $8.58, and 3-year-olds $9, and for heifer calves $9.08, yearlings $7.96, and 2-year-olds $8.58. Based on average selling prices for 60 yr., the losses per 100 lb. on steer calves were $2.22, yearling steers $1.84, and $1.51 and $1.55, respectively, for 2- and 3-year-old steers, and for heifer calves $1.88 and yearling heifers $2.11.

The rate of return on the owner's investment, after making an allowance for operator's labor, was 3.09 percent. It was found that over a period of years where all land necessary for operations is owned, $125 per cattle unit represents a fair investment. Of this amount 48 percent should be in land, 36 in cattle, 8 in buildings and improvements, 3.2 in machinery, equipment, feeds, supplies, and cash, and 1.6 percent in other livestock. For a fair chance of making a living wage and interest on investment, the average rancher should have from 33 to 40 percent of his investment in cattle.

The correlation analysis indicated that (1) an increase of 5 percent in the percentage of total investment was associated with 1 percent increase in return on investment; (2) calf crops up to 80 percent can be secured before the point of diminishing returns is reached; (3) ranch profits tend to increase with additional cattle units per man until an optimum is reached at about 185 head; (4) feeding more than 1.5 tons of hay per cattle unit was usually associated with decreasing ranch profits; (5) size of ranch materially affects chances of success, this being especially true until the size of the ranch approaches the economic unit of around 650 head, ranches with less than 200 head of productive units losing on an average 3.79 percent; (6) beef produced per cattle unit ranged from 185 to 350 lb., and each additional production of 20 lb. seemed to be associated with approximately 1 percent increase in ranch returns; and (7) an increase in receipts of $2.36 per cattle unit and a decrease in expenses of $2.64 were each associated with a 1 percent increase in ranch returns.

Economic factors affecting poultry production and marketing in Utah, 1929, 1930, and 1931, W. P. Thomas and M. Clawson (*Utah Sta. Bul. 244* (*1933*), *pp. 82, figs. 24*).—The first part of this study, made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., discusses the growth of the poultry industry in Utah, the available feed supply, Utah farm egg prices in different years for different grades of eggs in different localities, and the marketing of poultry products in the State. The second part consists of (1) an analysis of the entire farm business of the farms studied and (2) an analysis of the poultry enterprises. It is based on records secured chiefly by the survey method from 100 to 119 poultrymen each year, October 1, 1928, to

September 30, 1931, in 11 counties of the State, and on data regarding sales by individual producers secured from the Utah Poultry Producers Cooperative Association.

Fixed capital comprised 76 percent of the total capital invested on the farms. The average total farm receipts decreased 40 percent and the expenses 23 percent from 1929 to 1931. Average labor income was $1,206, $999, and —$29 and the return on owners' equity 7 percent, 6.4, and —2.4 percent, respectively, for the 3 years. In 1929 43 percent of the producers had labor incomes over $1,000 and 16 percent minus incomes as compared with 7 and 58 percent, respectively, in 1931.

The average investment in the poultry enterprise for the 3 years was $3,888, of which 54 percent was in fixed capital. The investment per hen was $3.90. Of the average expenses for the laying flock, 52 percent was general operating cost, 21 percent depreciation on chickens, 18 percent labor costs, and 9 percent overhead. The average costs, incomes, etc., for the 3 years, respectively, were cost per hen for laying flock $3.35, $3.45, and $2.75; cost of eggs per dozen 26.5, 24.8, and 21.6 ct.; net income per hen 42, 54, and —22 ct.; profit and return from labor per hen $1.06, $1.08, and 17 ct.; and net return per dozen eggs above cost, including labor of operator and family, 3.3, 3.9, and —1.7 ct. The most profitable and least profitable flocks showed the following averages for the 3 years: Return per hen for labor of operator and family $1.28 and 7 ct., cost of eggs per dozen 21 and 31 ct., eggs per hen per year 174 and 133, and percentage of eggs of extra grade 50 and 42. Highest net returns were obtained where there was high production per hen, comparatively low cost, and a high quality of product. Man labor per hen averaged 2.2 hr. for flocks of less than 500 hens and 1.2 hr. for flocks of over 1,500 hens.

The net cost of producing pullets until placed in the laying pen was 97 ct. for the first 2 years and 76 ct. in 1931.

An increase of 1 lb. in the quantity of feed fed pullets (65–95 lb.) increased the number of eggs laid by 1.15. An increase of 1 percent in the mash content of feed increased yearly egg production per hen 0.36 egg in mixed flocks and 0.79 egg in pullet flocks.

Percentage of death loss affected depreciation charges more than variations in inventory value, loss by culling hens, and loss by keeping hens over another year. The depreciation per bird in pullet flocks was more than four times that in old hen flocks.

The spread between the prices of extra and standard eggs averaged 18 to 25 ct. per dozen in the fall months and approximately 4 ct. in the summer months.

"The success of the poultry industry in Utah will be dependent upon such economic factors as cheapness of feed supply, efficient production and marketing, purchasing power of the consumer, and competition from other poultry areas."

Economic studies of dairy farming in New York.—XI, Success in management of dairy farms as affected by the proportion of the factors of production, P. H. Stephens (*[New York] Cornell Sta. Bul. 562 (1933), pp. 45, figs. 7*).—This study, continuing the series (E.S.R., 69, p. 454) and made to ascertain some of the most profitable combinations of factors of production on dairy farms, is based on 527 farm business records for the crop year 1921 obtained in 6 important dairy districts of the State and 509 records obtained in the Earlville area of Chenango County covering the crop years 1921–25.

Using 270 of the Earlville area records obtained from 54 identical farms, analysis is made to determine the effects on labor income of different percentages of labor used in crop production, of number of work units per man and per farm, of age and education of operator, of capital per farm, of operator's valuation of his own labor, and of ratios of labor expense to total farm expense, of labor expense on cows to total labor expense, and of capital investment to labor expense. Further analysis based on the same records is made of the relation of labor requirements in producing milk in herds of different sizes; of rates of milk production to physical requirements, costs, and income; of milk production per man to labor income; and of production per man and per cow to cost of production and labor income. The effect of tons of milk produced per man on 51 Tully-Homer area and 84 Oxford area farms in 1921 is also shown.

Based on the 509 Chenango County records, the use of manure, commercial fertilizer, and lime on different crops and the effect on yields and returns and the increase of agricultural production in the county are discussed.

Using the 527 records for the 6 dairy districts in 1921, correlation analysis is made of the relation of labor income to percentage of total receipts from crops, crop index, total man-work units per farm, man-work units per man, and the cost of milk production. Tables show the percentages of determination for each factor for each area and also the effect of 10 percent changes in each factor, the other 4 being held constant. Some of the findings were as follows:

Farms using more than the average percentage of all labor in crop production and those where labor expense made up more than about one third of the total expense were the most profitable. The amount of capital investment per worker was an important factor in the amount of work accomplished per man. An investment of approximately $10,000 per man was found most profitable. An average daily production of 3 10-gal. cans of milk per man was necessary for a satisfactory labor income in an area where the sole source of income was milk. Where the total volume of sales per farm was maintained at a similar high figure by sales of cash crops, a daily milk production of 2 cans per man gave a satisfactory income. A high production of milk per man was dependent on there being a large number of high producing cows per man. Number of cows kept per man was more important than production per cow in determining the milk output per man. In general, only farms where 40 tons or more of milk per man per year were produced and where the cows averaged 6,000 lb. or more per year were profitable. The manure produced on the farms was most profitably used on mixed hay and cabbage crops. Large applications of commercial fertilizers on market peas were profitable only when peas sold at $2 or more per bushel.

Percentage of total receipts from crops, crop index, man-work units per man and per farm, and cost of producing milk were associated with from 35 to 64 percent of the variations in labor incomes on the dairy farms studied in the 6 areas in 1921. Cost of producing milk was the most significant factor. Variations in efficiency of operation were associated with significant variations in labor incomes. Production per man of livestock products, chiefly fluid milk, increased 15 percent during the period 1921–25 in Chenango County.

An economic study of the production and utilization of milk in Maine, G. F. Dow (*Maine Sta. Bul. 367 (1933), pp. 287–416, figs. 29*).—This is a statistical bulletin consisting chiefly of tables, maps, and graphs showing the location, number, and size of dairy herds, the location of dealers' plants, the volume of milk and cream sold to large and small dealers in 1928, together with data as to seasonal variation in sales, butterfat content, prices, etc. Other tables show the amount and seasonal variation of dairy products sold or manufactured and shipped out of the State by the larger dealers in 1928, and the total consumption of milk and cream in the State in 1928.

The Missouri farm real estate situation for 1931–1932, C. H. Hammar and R. K. Moore (*Missouri Sta. Res. Bul. 203 (1933), pp. 52, figs. 10*).—This is a continuation of the study previously noted (E.S.R., 68, p. 398).

The following table shows the indexes (1927=100) of the values of farm real estate for 1931 and the first eight months of 1932 in the 13 counties studied:

Indexes of values of farm real estate, 1931 and Jan. 1 to Aug. 31, 1932, in Missouri type-of-farming areas

Type-of-farming area and county	Period	
	1931	Jan. 1–Aug. 31, 1932
Northern meat production:		
Atchison County	71.0	47.9
Harrison County	62.2	53.5
Sullivan County	64.4	49.7
Ralls and Callaway Counties	54.0	36.9
Johnson County	92.0	67.0
Ozark border (Franklin County)	83.1	103.3
Ozark meat production:		
Miller County	69.3	81.8
Reynolds County	80.2	70.2
Western corn and small grain (Barton County)	72.0	58.2
Ozark plateau dairy (Polk County)	85.5	53.1
Southwest fruit and dairy (Newton County)	69.2	44.1
Southeast lowlands (Pemiscot County)	62.8	47.9
State (13 counties)	61.3	47.5
State (weighted average)	70.5	53.8

The transfers during the first six months of 1932 covered 129,557 acres by warranty deeds and 88,261 acres by trustee and sheriff deeds, as compared with 92,086 and 46,895 acres, respectively, for the first six months of 1931. Foreclosures were heaviest in the areas in which land was most productive and where the ratio of mortgage debt to value of real estate was high. Of the foreclosures in 1932, 45 percent were purchased by individuals, 34.3 percent by insurance companies, 10.3 percent by deposit banks, and the remaining 10.4 percent by land banks, joint stock land banks, educational and eleemosynary institutions, farm mortgage companies, etc., the average considerations per acre being $15.16, $28.93, $18.11, and $21.22, respectively, averaging $21.44.

Farm tenancy and leasing systems in Maryland, W. P. Walker and S. H. DeVault (*Maryland Sta. Bul. 352 (1933), pp. 29–78, fig. 1*).—The amount, distribution, and types of farm tenancy in the United States and Maryland are described. Using data secured from tenant farmers in four areas of Maryland and farm organization and business records of 427 Maryland farms, of which 103 were operated by tenants, analysis is made of the types of leasing contracts as to division of crop and livestock receipts and expenses, and capital investment; returns to landlords and tenants; and the relationship between tenancy practices, crop rotation, and soil maintenance. The general problems concerning farm tenancy are discussed, and modification of the present leasing agreement suggested.

The percentage of Maryland farms operated by tenants decreased from 31 percent in 1880 to 27 percent in 1930. About 84 percent of the tenanted farms in 1930 were rented on a share-rent basis. Farm returns, 1929–31, were more favorable to the tenants than to the landlords in the two areas studied in which livestock enterprises supplied over 50 percent of the farm receipts. In the two areas where crop receipts were more than 50 percent of the total receipts, the division of returns was quite equitable. With the present share-rent system the leases are favorable to the landlord when crop prices are relatively high as compared with livestock prices. Relatively high prices for livestock favor the tenant.

Written agreements, samples of which are appended, were used on about one third of the rented farms. More than 25 percent of the tenants were limited by the landlords as to number of livestock that might be kept. Tenants averaged about five years on the same farm. About 50 percent of the landlords live close enough to supervise their farms.

Farm mortgage history of eleven southwestern Nebraska townships, 1870–1932, E. H. Hinman and J. O. Rankin (*Nebraska Sta. Res. Bul. 67* (*1933*), *pp. 67, figs. 22*).—Data were obtained from county records regarding all farm mortgages (14,630) filed from 1872 to 1932, inclusive, in 9 townships in York County and 1 township each in Saunders and Saline Counties. The soils, land use, and the number, size, and value of farms are discussed for each area. Tables and charts included and discussed show, by years, for different classes of mortgages the number filed; acreage involved; debt assumed per mortgage and per acre; interest rates; duration; type of lenders; residence of mortgagees; percentage of new and refinanced mortgages; amount of debt, total and per acre, outstanding; and the amount of mortgage debt. The relations during the period studied of mortgage filings to volume of land sales and sale prices of land, of mortgage indebtedness per acre to wholesale prices and net farm income, of total banking and life insurance power in the United States (aggregate resources of all commercial banks, loan and trust companies, and land banks reporting to the Comptroller of the Currency and of all land banks and life insurance companies in the United States) and farm mortgage debt outstanding in the 11 townships, the number of foreclosures and acreage and consideration involved in such foreclosures each year, 1874–1932, and in assignments, 1920–32, and the present mortgage situation in the townships are discussed.

The average debt per acre in mortgages filed during the several years increased from $3 in 1876–79 to $63 in 1920, then decreased to $26 in 1932. Debt per acre outstanding rose from $3 in 1875 to $72 in 1923, and then declined to $61 on January 1, 1933. During the last 20 years there has been a conspicuous increase in the loans obtained from mortgage investment companies and junior loans obtained from commercial banks. Interest rates since 1906, except in 1920–22, have remained fairly constant at about 5.5 percent. Since approximately 1900, with the exception of a few years, 60 percent or over (as high as 83 percent for first and 90 percent for junior mortgages) of both first and junior mortgages were made to lenders residing in the same county. During the period 1921–30, about 25 percent was made to lenders in other parts of the State.

Mortgage loans on farm real estate in Turner County, South Dakota, 1910–1930, with special reference to Middleton, Hurley and Norway Townships, G. Lundy (*South Dakota Sta. Circ. 12* (*1933*), *pp. 49, figs. 17*).—The method of analysis of the data and the form of presentation are the same as that followed in the study previously noted (E.S.R., 70, p. 115). The indexes (1910=100) for Turner County for 1915, 1920, 1925, and 1930, respectively, were: Total farm mortgage indebtedness, 167, 237, 283, and 230; acreage mortgaged, 112, 109, 126, and 115; and debt per acre mortgaged, 149, 217, 224, and 200. Unredeemed foreclosures during the periods 1921–25 and 1926–30 were 4.9 and 4.5 percent, respectively, of the total debt at the beginning of the periods. The acreages lost were 8 and 6.5 percent, respectively, of the total areas mortgaged at the beginning of the periods. Delinquencies were 1.5 percent of the total debt in 1910, 10.2 percent in 1915, 9.6 percent in 1920, 13.5 percent in 1925, and 8.6 percent in 1930.

In 1910, 52.9 percent of the first-mortgage funds came from individuals, and 23.4 percent from insurance companies. In 1930, 71.2 percent came from insurance companies and 19 percent from individuals. The ratio of debt to recorded sales prices was 42.4 percent in 1910, 42.6 percent in 1920, and 57.1 percent in 1930. Rates of interest varied from 5 and 6 percent in 1910 to 5.5 and 5 percent in 1930.

Lands which had been purchased during the period studied showed twice as large a percentage under mortgage as lands not sold during the period.

Louisiana farm taxes.—III, Proposed revision in Louisiana's tax system, R. L. Thompson (*Louisiana Sta. Bul. 231, pt. 3* (*1933*), *pp. 48*).—The purpose of this third section of the study previously noted (E.S.R., 69, p. 886) is "to outline, in as definite and concise form as is possible, information that will serve as a basis for revising the State and local finance systems of Louisiana. It is especially designed for the tax interested people of the State."

Tables are included and discussed showing, by years, the changes in the assessed value of property and taxes levied, 1920–32; source and amount of revenue receipts collected for State purposes, 1927–31; net debt of the State compared with bordering States, 1927–31; classification and status of obligations of the State, 1933–37; governmental cost payments of the State, by functions, 1927–31; and local tax levies, 1927–32.

Possible improvements in the present tax system and also new taxes (sales and State income), property tax offsets, and suggested changes in tax collections are discussed.

The objectives and activities of the California farm bureau, E. D. Tetreau (*California Sta. Bul. 563* (*1933*), *pp. 89, figs. 3*).—This study has to do particularly with commercial activities—marketing farm products, purchasing supplies, insurance, etc.—of the California farm bureau. The development and structural organization of the California farm bureau and the activities other than commercial of such bureau are described. Using data obtained by interviews with 301 farmers belonging to farmers' general-purpose organizations and 139 nonmembers, comparison is made of the two groups regarding extent of farming operations, affiliations in other organizations, affiliations in commercial organizations, interest in public questions, and use of service centers. The marketing and purchasing activities of the county farm bureaus and the California Farm Bureau Federation, the obtaining for members of special discounts from local dealers and merchants, the activities of the bureaus and the Federation as regards fire, automobile, life, and workmen's compensation insurance, and the significance of such activities are discussed and an evaluation made of the farm bureau objectives and activities. Tables are included and discussed showing the views of 199 farm bureau members as to the chief functions of a farm bureau.

In his conclusions and recommendations the author states, "There seems to be an inherent danger in the engaging of a general-purpose farmers' organization in collective selling and purchasing operations; namely, that officials may devote too much attention to these activities and neglect other and more fundamental activities."

"If commercial activities are to be undertaken by the California farm bureau it would appear to be justified in undertaking only such activities as will not require a disproportionate amount of time by officials, will not involve the county farm bureaus or the Federation in financial obligations, and will result in direct savings to members of the farm bureau as such. With certain qualifications the negotiation of trade discounts and rebates and specially favorable insurance rates on behalf of members would come in this category. Assistance to cooperative associations and to members in the formation and strengthening of cooperative associations and general educational work in connection with the marketing of farm products and the purchase of farm supplies are activities which are in harmony with the broader objectives of the organization. It appears especially desirable that the farm bureau should not undertake any commercial activities which may bring it into competition with the cooperative associations which are in operation in nearly every important agricultural county in California."

History of cooperation in the marketing of California fresh deciduous fruits, E. Kraemer and H. E. Erdman (*California Sta. Bul. 557 (1933), pp. 121*).—The development of cooperation is traced and discussed under the following headings: Early horticultural history of the deciduous fruit industry, beginnings of collective action, early influence of general-purpose farm organizations, continued efforts to establish a central cooperative agency, local and regional cooperative developments, and recent plans of combining growers' and dealers' interests.

Farmers' cooperative associations in Florida.—II, Organization and management, M. A. Brooker and H. G. Hamilton (*Florida Sta. Bul. 263 (1933), pp. 100, figs. 22*).—This second bulletin of the series on farmers' cooperative associations is based on data obtained by personal visits to all associations listed in the previous bulletin (E.S.R., 67, p. 619) that were organized early enough to operate during the 1929–30 marketing season. The development, location, legal status, degree of activity, and volume of business (1929–30) of cooperative associations in Florida and other cooperative efforts in the State are described.

The tables and analysis for associations for marketing citrus fruits are chiefly for the years 1926–27 to 1929–30, inclusive. They cover membership; volume of business; net sales; average balance sheets and profits and losses for all associations for each of the four years, for the associations in 1929 and 1930 grouped by volume of net sales, and for each of the last three years of operation for those that have ceased to operate; and operating income and expenses per box for each year, the associations being grouped on the basis of volume of business and whether or not operating precooling plants. Correlation analyses are made for each year of the relation of volume of fruit handled to percentage gross margin, turn-over of fixed assets, sales of fruit per member, and investment per box, and the relations to cost of processing per box for associations not operating precooling plants of volume of business, turn-over of fixed assets, investment per box, and sales of fruit per member. The pooling operations and administration and management of the associations are briefly discussed.

The section on truck crops includes tables and analyses covering the volume of sales of different kinds of crops, membership and patronage, balance sheets, and profit and loss statements, by years 1927–30, and by associations grouped by volume of net sales, 1928–29 and 1929–30. The administration and management, sales policies, pooling practices, and the credit operations of the associations are discussed.

The volume of business, net sales, balance sheets, and profit and loss statements for the years 1928–29 and 1929–30 for associations marketing livestock and livestock products are analyzed.

Of the 374 associations organized from 1889 to 1929, 50.8 percent were active in 1929–30, 34.5 percent had once operated but were inactive, and 14.7 percent had never been commercially active. More than 25 percent of the failures took place in the first year of operation and two thirds within the first 5 years. Lack of volume of business was the chief cause of failure.

In 1929–30 there were 70 active local citrus associations with a membership of 6,692 having net sales (62 associations) of $14,654,011 and handling 36.5 percent of the total volume of sales of the State. The average net worth per association increased from $21,920.24 in 1927 to $32,984.44 in 1930. There was no significant change in the relationship between current, deferred, fixed, and other assets. Due to loans from the Federal Farm Board, the percentage of long-term borrowings increased and the current liabilities decreased. The ratio of net worth to total liabilities showed no significant change, but the ratio of current assets to current liabilities changed from 1.7 : 1 to 3.6 : 1.

In general, the percentages of total assets represented by fixed and deferred assets increased and those represented by current and other assets decreased with size of business. The percentages of total liabilities represented by current and fixed liabilities combined increased with decreasing size of business and those represented by other liabilities increased with increasing size of business. Ratio of current assets to current liabilities, percentage of members' equity, and turn-over of fixed assets reflected clearly the advantage of the larger associations.

In 1928–29 and 1929–30 large associations had a higher percentage of net incomes notwithstanding they had a smaller percentage of gross margins. Costs per box of processing fruit were influenced favorably by large volume of fruit, turn-over of fixed assets larger than the average, investment in fixed assets per box less than the average, and large volume of fruit per grower.

In 1929–30, 52 truck crop associations with an average membership of 75 were active. The net sales of 31 totaled $6,935,884. Although the small associations took larger percentage gross margins, the average net operating income was only 3.7 percent for associations with net sales of $100,000 or less as compared with 27.8 percent for those with sales over $100,000.

The total net sales in 1929–30 of 12 of the 17 active livestock and livestock products associations were $615,883 and those of 10 of the 17 active miscellaneous associations $870,153.

Community production and distribution of cotton planting seed in a one-variety cotton community, J. E. Hite (*U.S. Dept. Agr. Circ. 286 (1933), pp. 16, figs. 2*).—The extent of cotton growing, and the organization and operation of the seed-distributing agency in the San Joaquin Valley of California, the largest one-variety cotton community in the United States, are described.

A pioneer one-variety cotton community in Collin County, Tex., R. F. Saunders (*U.S. Dept. Agr. Circ. 293 (1933), pp. 11, figs. 3*).—The conditions leading up to and the efforts in organizing the Collin County Standardization Association, the problems and difficulties of the association, and the results obtained are described.

Grade, staple length, and tenderability of cotton in the United States, 1928–29 to 1931–32 (*U.S. Dept. Agr., Statis. Bul. 40 (1933), pp. [2]+158, figs. 10*).—The data used were collected in cooperation with the California State Department of Agriculture and the agricultural experiment stations of the following States: Alabama, Arizona, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas.

Tables show (1) for the United States and each of the States for the crops of 1928, 1929, 1930, and 1931 the quantities of American upland cotton of different grades and staple lengths ginned, the quantities of different grades and staple lengths ginned during specified periods of each year, and the quantities of $\frac{7}{8}$- to 1$\frac{1}{32}$-in. and 1$\frac{1}{16}$-in. and longer cotton tenderable in settlement of futures contracts made subject to the United States Cotton Futures Act and the regulations of the Secretary of Agriculture thereunder; (2) by designated districts for Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas the quantities of different staple lengths ginned during each of the four years; and (3) the quantities of different grades and staple lengths on hand in the United States on August 1 of each year.

Other tables show similar data for the United States for American-Egyptian cotton, the quantities of Egyptian and other foreign cotton on hand in the United States on August 1 each year, and the quantities of American upland cotton of different grades and staple lengths ginned in Georgia and in Oklahoma and Texas from the 1927 crops.

Annual report of the Chief of the Grain Futures Administration, 1933, J. W. T. Duvel (*U.S. Dept. Agr., Grain Futures Admin. Rpt., 1933, pp. 10*).—This report includes tables showing the volume of trading in wheat, corn, oats, rye, barley, flax, and all grain futures during the fiscal year ended June 30, 1933; the average, maximum, and minimum daily volume of the Chicago Board of Trade; the monthly volumes of wheat and corn on each contract market; the open commitments on each wheat and corn future; and the volume of sales during the life of each principal grain future on the Chicago Board of Trade, as well as other data.

Wheat futures (*U.S. Dept. Agr., Statis. Bul. 41 (1933), pp. 110, figs. 4*).—This publication supplements that previously noted (E.S.R., 64, p. 788) by presenting the data regarding volume of trade, open commitments, and prices from January 2, 1930, to December 31, 1932. Two additional markets, Omaha, Nebr., and Hutchinson, Kans., are included.

Hedging grain by farmers elevators: Gains and losses, A. H. Benton (*North Dakota Sta. Bul. 272 (1933), pp. 42, pls. 4*).—The objectives of this study, made in cooperation with the U.S.D.A. Bureau of Agricultural Economics, were "to determine and compare for the elevators included the actual gross trading profits or losses on various grains, with the estimated gross trading profits or losses if hedging had been complete or if grain had not been hedged at all." It is based on data for the years 1925–26 to 1928–29, inclusive, obtained from elevators in South Dakota, North Dakota, Minnesota, and Montana, principally South Dakota. Six to 21 elevators are included each year for hard spring wheat, durum wheat, rye, oats, barley, and flaxseed. The characteristics of grain marketing in the area, and the theory and costs of hedging are described. Analysis is made for each year of the percentage of elevators that were not closely hedged, of the gains or losses from price fluctuations on unhedged grain of each kind, of the market position of the individual elevators, and of the hedging results for each grain.

The weighted percentages of the elevators not closely hedged were 67.1, 64, 51.5, and 59.7, respectively, for the 4 years. Losses from price fluctuations on unhedged grain were experienced by 57.3, 60, 33.3, and 43.3 percent of the elevators in the different years. The average daily market position each year was "long." The percentage "long" varied from 72 to 83.6. Spread losses were more numerous than spread gain, no group of elevators having an average spread gain on any kind of grain in any one of the 4 years. Actual average gross trading profits on each kind of grain, except durum wheat in 1927–28, for elevators practicing more or less complete hedging were lower than the estimated gross profits if the grain had not been hedged. This fact is accounted for in part by the price trends during the period.

Local marketing of high protein wheat in 1932, H. H. FINNELL (*[Oklahoma] Panhandle Sta., Panhandle Bul. 52 (1933), pp. 15–21*).—This is a continuation of the study previously noted (E.S.R., 68, p. 264). A table shows for each of the 131 farmers the number of bushels sold, percentage of protein, premium due and received, and amount of premium lost by selling before testing, insufficient quantity for handling, no bids or low bids in local market, and amount gained by competitive buying.

The average premium due farmers at the time of selling was 7.6 ct. per bushel, and the average premium received was 2.9 ct. per bushel. Members of the Oklahoma Wheat Growers Association received 47.7 percent of the premium due as compared with 18.7 percent received by nonmembers. The average for the 131 farmers was 42.6 percent as compared with 71.4 percent in 1931. The loss of premium was largely a result of the extreme uncertainty of the market demands for premium quality wheat.

An analysis of the Fresno milk market, J. M. TINLEY (*California Sta. Bul. 559 (1933), pp. 59, figs. 5*).—This is the third (E.S.R., 65, p. 483; 68, p. 114) of the series of studies dealing with milk-marketing in California. Tables, charts, and discussions cover the consumption, sanitary requirements, production, and buying prices of market milk. Detailed analyses are made of the system of distribution, the number and capacity of distributing plants, distributor's margins, expenditures and incomes, methods and costs of delivery, retail-store margins, and the problems in distribution.

The volume of milk distributed by the four plants operated in Fresno has declined appreciably since 1930. About 60 percent of the milk was sold through retail grocery stores and only 15 percent directly to homes. Since 1930, store prices per quart have been 2 ct. less than retail delivery prices. Store prices declined from 14 ct. in 1929 to 10 ct. in 1932, and the average milk-fat content increased from 3.7 percent in 1929 to 4 percent in 1931 and 1932. A continuation of the prices paid dairymen during the last months of 1932 may jeopardize the milk supply of the city. While the volume of milk distributed decreased from 1929 to 1932, the number of distributors increased. Considering the facts that the amount of milk sold at wholesale increased from about 50 percent in 1929 to 85 percent in 1932, and that the percentage of butterfat also increased, distributors' margins during the last half of 1932 were little if any greater than in 1929 and were inadequate in 1930, 1931, and 1932 to meet even operating expenses.

Suggestions made for reducing costs of distribution include (1) requiring that the established wholesale price to stores and restaurants apply only to purchasers of a case of milk or over, (2) restricting the number of deliveries at the lowest rates to 2 a day in summer and to 1 in winter, (3) providing that established lower rates apply only to regular purchasers, (4) trading business among distributors, (5) eliminating all special discounts, (6) attempts to get retail stores to handle milk on a smaller margin, and (7) the introduction of a universal store bottle and a bottle deposit charge.

It is also suggested that a milk trade board be established to investigate matters in dispute, to collect and analyze data relative to the economics of milk marketing and suggest more economical methods of handling milk, to assist in determining buying and resale prices of milk, and to disseminate information to the public. It is also suggested that the dairymen form a collective bargaining association to establish prices and quotas, and to arrange for the disposal of surplus milk and methods and rates for hauling.

Shipping Massachusetts apples to out-of-State markets, A. H. LINDSEY and A. A. BROWN (*Massachusetts Sta. Bul. 299 (1933), pp. 27, fig. 1*).—Information-tion is brought together regarding transportation and marketing facilities in New York City and other markets outside of New England less used by Massachusetts growers. The problems of Massachusetts growers, the potential markets, current shipping practices, railroad and trucking charges and services, and the terminal facilities in the best prospective markets for New England apples are described.

The general conclusion arrived at is that the solution of the New England apple marketing problem should be based on centralized distributing units and cooperative organizations of growers.

Consumer preferences for egg yolk color and shell color in New York City, F. L. THOMSEN and B. WINTON (*Missouri Sta. Bul. 329* (*1933*), *pp. 23, figs. 5*).—This study was made to determine the actual preferences of New York City consumers for yolk and shell colors of eggs. A total of 10,358 consumers purchasing from 87 stores of a chain store was chosen with a view to furnishing a cross section of the population of the city from the standpoint of nationality, purchasing power, and geographical distribution. The consumers were shown yolks of light, medium, and dark color, and white and brown shell eggs and asked to express their preferences and the reasons therefor. Uniform shades of yolk color were obtained by using eggs produced under controlled feed conditions and objective color readings of the yolks were obtained. Some tests were also made at dealers' candling conferences at Des Moines, Iowa, Chicago, Ill., and New York City to determine the ability of candlers to detect yolk color and to place eggs according to yolk visibility.

Of the consumers in the different boroughs, from 27.5 to 37.4 percent, averaging 35.9 percent, preferred light color yolks; 17.9 to 22.9 percent, averaging 20 percent, medium color yolks; 22.7 to 32.8 percent, averaging 24.9 percent, preferred dark color yolks; and from 17.8 to 21.6 percent, averaging 19.2 percent, had no preference. The most pronounced preference for the light yolks was found among the Scandinavians, Polish, German, and Irish peoples. Negroes, Americans, and Italians showed the strongest desire for the medium to dark yolks. The Jews were relatively neutral, contrary to the general belief that they are mainly responsible for the erroneously assumed preference for light yolks. There was but little difference in choice of yolk color among groups of different purchasing power.

From 25 to 54.2 percent, averaging 49.5 percent, of the consumers in the different boroughs preferred white shells; 25.2 to 48.6 percent, averaging 28.4 percent, preferred brown shells; and from 20.6 to 26.5 percent, averaging 22.1 percent, had no preference. Shell color preferences seemed to be influenced by nationality in much the same way as yolk color preferences. Purchasing power had little or no relation to shell color preferences. The highest purchasing group showed the strongest preference for both brown shells and dark color yolks.

The author states that "analysis of the percentages indicates that a price premium for any yolk color is not justified from the standpoint of either consumers or distributors," and also that "in some boroughs a majority was in favor of white shells, justifying a price premium, but in others this was not true." The study suggests the following recommendations:

"(a) The undesirability of using the term visibility in standards for individual eggs which are a part of Federal and New York egg grades, (b) a program of service to retail distributors of eggs designed to eliminate present discriminations against midwestern eggs which are not the result of actual quality differences, (c) a program of consumer education designed to eliminate false prejudices against brown shell and medium to dark yolk eggs, and make it possible to obtain premiums for midwestern eggs when actual quality may justify."

Crops and Markets, [November–December 1933] (*U.S. Dept. Agr., Crops and Markets, 10 (1933), Nos. 11, pp. 409–448, figs. 3; 12, pp. 449–528, figs. 3*).—Included in each number are tables, reports, charts, summaries, etc., of the usual type. No. 11 has a brief statement of the agricultural outlook for 1933–34, based on the report noted on page 696, and No. 12 the final crop and livestock estimates for 1933, with comparisons with 1931 and 1932.

Handbook of poultry and egg statistics, T. R. PIRTLE and R. R. SLOCUM (*U.S. Dept. Agr., Misc. Pub. 158 (1933), pp. II+105*).—Included are 109 tables pertaining to the United States and 9 to foreign countries.

"Data for the United States are classified as farm production and utilization, commercial handling and use, market receipts, cold-storage stocks, imports and exports, prices, standards, conversion factors, and composition. The tables on farm production and utilization include data as to numbers of poultry and egg production in the last several census years, as shown by census returns and by reports to the Division of Crop and Livestock Estimates, and as to production, feed requirements, fattening, dressing, and transportation data, as determined by various surveys. . . .

"Poultry numbers, eggs produced, poultry and egg imports and exports, and other data for foreign countries were compiled mainly from official publications of the respective countries."

Local prices of farm products in Nebraska, 1895–1932, H. C. FILLEY and A. M. HAUKE (*Nebraska Sta. Bul. 284 (1933), pp. 38, figs. 6*).—Data were obtained chiefly from 10 newspapers published in 4 areas of the State and from State and Federal reports. Tables are included showing, by months 1895–1932, for corn, wheat, oats, hogs, eggs, and potatoes, 1895–1919 for butter, and 1920–32 for butterfat, the average prices and the indexes of price relatives and purchasing power.

Ohio Agricultural statistics, 1932, A. R. TUTTLE, R. E. STRASZHEIM, and P. P. WALLRABENSTEIN (*Ohio Sta. Bul. 530 (1933), pp. 54, fig. 1*).—This bulletin prepared in cooperation with the Bureau of Agricultural Economics, U.S.D.A., continues the statistics previously noted (E.S.R., 68, p. 120). It includes preliminary estimates, by counties, for 1932 of acreages, yields per acre, and total production of different crops, and for numbers of different kinds of livestock on farms January 1, 1933. Revised county estimates for 1929, 1930, and 1931 are included for winter wheat, and for the number of sheep on farms January 1, 1932. Statistics covering a number of years are given for acreages, yields, December 15 prices, and total value of crops. Numbers, value per head, and total of livestock, prices of livestock products, farm wages, etc., are also included.

RURAL SOCIOLOGY

Trends in town-country relations, J. H. KOLB and R. A. POLSON (*Wisconsin Sta. Res. Bul. 117 (1933), pp. 37, figs. 11*).—This study was made in cooperation with the U.S.D.A. Bureau of Agricultural Economics and the President's Committee for the Study of Recent Social Trends. Town-country relations in Walworth County are compared with conditions existing in that county in 1913, as reported in Research Bulletin 34 (E.S.R., 33, p. 394).

A significant trend disclosed is the emergence of an enlarged community comprising country and small town or village groups. In the earlier study some 12 areas with their farms which depended on their village centers for certain regular services were mapped, including general trade, banking, newspaper, milk marketing, school, church, and library. In the years intervening between 1913 and 1929 many forces were at work affecting rural society. Improvements in communication and transportation tended to increase contacts between country and town or village people. Mobility of population, seen in cityward and countryward movements, has raised many local problems of readjustment.

The changing role of the service centers are discussed from rural, urban, and rural-urban, or "rurban" viewpoints. Notes on the history and methodology employed in town-country relation studies are included in an appendix. The close relationship between the Wisconsin studies and antecedent studies in New York State is indicated, and suggestions are made for future studies.

A study of rural public health service, edited by A. W. FREEMAN (*New York: Commonwealth Fund; London: Oxford Univ. Press, 1933, pp. XXXIV+236, figs. 6*).—This study was designed to help advance rural health practice.

Rural crime control, B. SMITH (*New York: Inst. Pub. Admin., Columbia Univ., 1933, pp. X+306*).—"The purpose of this volume is to lend definition to the rural crime problem, to trace the causes for recent developments which have made that problem more acute, and critically to examine the functioning of various criminal justice agencies which are directly concerned with its treatment and solution."

The rural community and social case work, J. C. BROWN (*New York: Family Welfare Assoc. Amer., 1933, pp. IX+165*).—This book offers concrete suggestions both for immediate steps and a long-time program in carrying forward the development of social work activities in rural communities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Report of extension work in agriculture and home economics in the United States, 1932 (*U.S. Dept. Agr., Ext. Work Agr. and Home Econ. Rpt., 1932, pp. 80*).—This report covers the fiscal year ended June 30, 1931, as regards funds, and the year ended November 30, 1931, as regards results of work done. Funds and personnel, the taking of information to the farm, putting information into practice, methods of presenting extension information, professional improvement, research in extension education, and the production of exhibits, motion pictures, film strips, photographs, and other visual aids are discussed. Pages 52–80 are devoted to statistical tables showing results and finances.

The new agriculture, K. C. DAVIS (*Chicago: J. B. Lippincott Co., 1933, 3. ed. rev., pp. V+495, figs. 325*).—This revised text (E.S.R., 50, p. 94), although planned primarily for secondary schools, is also designed for use in teachers colleges and normal schools. The topics and subject matter are arranged to conform to the project plan of teaching. Methods recently developed by the State agricultural colleges and experiment stations are included and also suggestions for surveys, problems, charts, projects, etc.

The young man in farming, A. K. GETMAN and P. W. CHAPMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1933, pp. IX+216, figs. 17*).—This volume has been prepared to assist pupils in junior high schools and vocational agricultural courses in gaining accurate information in regard to farming as an occupation. It includes chapters as follows: The outlook in farming; becoming a skillful workman; learning to think right; how science helps the farmer; learning how to study agriculture; the value of an education; getting started in farming; producing and consuming goods; paying for goods and services; spending, saving, and investing income; working well with others; the young farmer and his Government; characteristics of a successful farmer; planning for the future of agriculture; and our ideals and aspirations.

FOODS—HUMAN NUTRITION

Food products, H. C. Sherman (*New York: Macmillan Co., 1933, 3. ed., rewritten, pp. XII+674, figs. 42*).—This well-known text and reference work has been completely rewritten in order to incorporate the new material which has become available in the nearly 10 years since the publication of the previous edition.

"Special attention is given to recent developments in the economics of the food industries and to standardization of foods. Many new Government data both on food production and consumption and on food composition have been incorporated and the results of much recent laboratory work have been utilized both in the rewriting of the text and in the revisions and extensions of the tables of mineral elements and vitamin values." The appendixes include the complete text of the Food and Drugs Act, with the various amendments which have been made to it, the Federal Meat-Inspection Law and Regulations, and tables on the calcium, phosphorus, iron, copper, and manganese contents of food and on qualitative vitamin values.

[Food studies at the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 261–264*).—This progress report (E.S.R., 68, p. 697) deals with a continuation by S. Woodruff of studies on the bread-baking qualities of Illinois soft-wheat flours, a study of the properties of a wheat flour which make it desirable for cake baking, and further studies, also by Woodruff (E.S.R., 70, p. 124), of gelatinization changes in wheat starch.

Baking of flour mixtures at high altitudes (*Colorado Sta. Rpt. 1933, pp. 15, 16*).—This progress report of studies conducted in the altitude laboratory previously described (E.S.R., 65, p. 90) contains a summary by M. A. Barmore of the physicochemical properties of egg white foam as determined by viscosity and surface tension studies, and the effect of barometric pressure, beating time, pH, salt, and age of eggs on foam structure.

Studies relative to the hydrolysis of the fat of home-cured hams, W. C. Supplee and L. B. Broughton (*Maryland Sta. Bul. 350 (1933), pp. 561–569, figs. 3*).—As a part of an investigation of the various practices concerned in the production of home-cured hams at the station, chemical studies have been made of a number of hams which had been stored at room temperature for from approximately 1 mo. to 2 yr.

One of the most extensive changes found to characterize the aging process was the hydrolysis of the fat, with the formation of free fatty acids more unsaturated than the acids of the remaining unhydrolyzed portion of the fat.

Hydrolysis of both the lean meat fat and the fat of the external adipose tissue was very rapid during the early months of storage, after which it proceeded more slowly and practically ceased in about 2 yr., with maximum values of 30 and 20 percent for the meat fat and adipose tissue fat, respectively. The decrease in moisture content followed about the same rate. It is noted that similar changes were also observed in Smithfield hams after aging. Iodine number determinations of several samples of fat from country-cured hams which had undergone varying degrees of hydrolysis and from lard at different stages of hydrolysis with lipase showed that the unsaturated acids in both instances hydrolyzed more rapidly than the saturated, and that consequently the changes in fatty acid content of the hams on hydrolysis are probably characteristic of enzymatic hydrolysis of fat under all conditions.

Rat feeding experiments on diets furnishing free fatty acids such as present in the country-cured ham showed that on the basis of growth, food consumption, and general appearance quantities of hydrolyzed lard up to 15 percent of the diet had no disadvantage over neutral lard.

Composition of eggplant fruit at different stages of maturity in relation to its preparation and use as food, C. W. Culpepper and H. H. Moon (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 9*, *pp. 705–717*, *figs. 5*).—This investigation by the Bureau of Plant Industry, U.S.D.A., was undertaken to determine at what stages of maturity the eggplant is most desirable as a food and what are the causes of its tendency to soften, shrink, turn bitter, and discolor on exposure to air and cooking. Several varieties of the fruit grown at the Arlington Experiment Farm and picked at different stages of maturity were used for chemical analyses, which included total solids, sugars, acid-hydrolyzable polysaccharides, nitrogen, titratable acidity, and total astringency. Quality tests for pectin and specific gravity determinations were also made.

The total solids were low at all stages of maturity, ranging generally from 7 to 9 percent of the fresh green weight. They were highest at time of flowering, decreased rapidly for a few days, after which they remained practically constant. A substantial portion of the total solids consisted of sugars, which ranged from 2 to 3.5 percent of the fresh green weight. The sugars were the highest at about 40 days, or the time when the fruit is generally used. Starch or other material converted into sugar by acid hydrolysis was low. The percentage of nitrogen was low, being highest in young fruits and reaching a constant level at about the time of ordinary picking. A small amount of nitrate nitrogen was present at all but the very earliest stages of development. The tritratable acidity was low at all stages and particularly so at the time of ordinary use. There was a significant quantity of astringent material present. The specific gravity was low in all cases. There were no significant differences in the composition of the varieties studied.

Cooking tests, taken in conjunction with the chemical tests, indicated that "the failure of the material to hold its form was due to the high moisture content of the material, associated with the change of a considerable part of the protopectin into pectin during cooking. This resulted in a product that was very soft in texture. The heating had a tendency to drive out the air, causing the material to shrink. The tendency for the material to turn dark in cooking seemed to be due to the presence of tanninlike substances associated with low acidity. Iron and salts also reacted with the tannins to form compounds that darkened in the air; hence it is obvious that care should be exercised not to bring the material into contact with iron.

"In the canning process there was a tendency for the product to turn dark, become soft, and lose its form. The tin can was rather severely corroded by the material. The presence of oxygen and nitrates suggests that these may have been responsible for the action on the can."

Some factors affecting the wholeness of canned tomatoes, J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc.*, *29* (*1932*), *pp. 505–508*).—Some differences were observed by the Indiana Experiment Station in 1926 and 1927 between varieties with respect to the retention of weight and shape of tomatoes in the peeling process. In 1927 there was observed little or no difference in wholeness between sterilization in a continuous steam cooker and an open kettle at 212° F. Marked differences found between the products of different factories with respect to wholeness are ascribed largely to differences in supervision during packing. Where tomatoes were placed in the can carefully there was little difficulty in obtaining a product desirable from the standpoint of wholeness.

Home canning, M. C. Pfund (*N.Y. Agr. Col.* (*Cornell*) *Ext. Bul. 261* (*1933*), *pp. 74*, *figs. 4*).—In addition to the material usually found in publications on home canning, this bulletin contains a number of unusual features which should be of considerable help to the housewife planning to do extensive canning. In the introductory general section on methods of preservation, spoilage, modern canning methods, and equipment, a table is given of the approximate yield of home-canned products from raw materials, including various common fruits and vegetables and meat and poultry. Standards are given for canned fruits and vegetables and meats, with a score card for judging the appearance of the product and container and the quality of the contents. A table is also given which summarizes common defects in canning, with possible reasons for failure, together with a list of types of carelessness which may lead to spoilage.

Specific directions for canning, with selected recipes, are given under three headings: (1) The canning of fruit, rhubarb, tomatoes, and fruit juices, (2) the canning of vegetables, and (3) the canning of meats, poultry, and fish. Although the canning of vegetables, meats, and poultry by the boiling water bath method is not recommended, directions are given for use in emergency and a blank is added on which to record the amount of such canning and a record of spoilage, with request that it be returned to the college.

Supplementary sections are included on Why and How to Plan for Fruits and Vegetables, by H. M. Hauck; A Suggested Vegetable and Fruit Budget, by M. E. Wells; and Let the Garden Yield the Year's Vegetable Supply, by members of the department of vegetable crops of the New York State College of Agriculture.

Microbiology of frozen foods, I, II, G. I. WALLACE and F. W. TANNER (*Fruit Prod. Jour. and Amer. Vinegar Indus., 13 (1933), Nos. 2, pp. 52–54, 56; 4, pp. 109–113*).—This is a comprehensive review of the literature on the effect of freezing bacteria, yeasts, and molds. An extensive list of references is appended.

Microbiology of frozen foods, IV, V, G. I. WALLACE and S. E. PARK (*Jour. Infect. Diseases, 52 (1933), No. 2, pp. 146–149, 150–156*).—These two papers continue the series noted above.

IV. *Longevity of certain pathogenic bacteria in frozen cherries and in frozen cherry juice.*—To determine the longevity of certain members of the colon typhoid group in frozen foods, cherries and cherry juice were inoculated with the food poisoning organisms *Eberthella typhi, Salmonella schottmülleri,* and *S. aertrycke,* and also with *Bacterium coli* and *Proteus vulgaris,* sealed in suitable containers and stored at −17.8° and at −40° C. for 20 weeks in the case of the cherries and 4 weeks for the juice. Samples were subjected to bacterial examination at weekly intervals during these periods.

In cherry juice the organisms showed a survival period of less than 4 weeks and in the cherries from 2 to 3 mos. "These results indicate, therefore, that in the frozen food industry special attention should be given to the sanitary quality of water used and to medical inspection of employees who handle the foods."

V. *The behavior of Clostridium botulinum in frozen fruits and in vegetables.*—The possibility of danger from botulinum toxin in frozen foods was tested in several ways—by inoculating fruits and vegetables before being placed in frozen storage with toxic and detoxified cultures of *C. botulinum* A and B, by incubating cultures of both types with other organisms at room temperature, by alternately freezing and thawing spore suspensions of the organism, and by inoculating cans of beans, peas, and cherries with atoxic cultures and allowing them to stand at room temperature for varying periods of time and then freezing. In all cases the products were tested for toxicity by feeding to guinea pigs.

The findings and their significance from the standpoint of the consumption of frozen food products are summarized as follows:

"The data from these studies would indicate that if foods are canned properly and used immediately after defrosting there is little danger of botulism from frozen foods. Toxin is not readily destroyed by freezing, but there is little chance of toxin being present in properly prepared frozen foods. Toxin was not produced in these studies before freezing nor, with few exceptions, during freezing. It must be remembered that the inoculations used were massive compared with the natural inoculation encountered in food for canning, and while the few cases in which toxin was formed or liberated during freezing might seem important in this study, in the canning industry they probably would not be so considered because of this difference in inoculation. The spores of *C. botulinum* are resistant to freezing, and once in frozen food they probably remain there for long periods of time. This is not of great importance if foods are canned and frozen properly, and if they are consumed soon after thawing. If foods containing spores are allowed to thaw and stand at room temperature for several days before using, they may become very dangerous. This is especially true of frozen vegetables."

Food poisoning, J. C. Geiger and J. P. Gray (*Jour. Amer. Med. Assoc., 101 (1933), No. 13, pp. 975–979*).—This paper discusses the control of food poisoning by describing in considerable detail three outbreaks in San Francisco, with the epidemiological and laboratory procedures involved, and by comparing the practices carried out in this city with those of other major cities. It is emphasized that "the control of food poisoning is not an unachievable goal, but present-day methods must be more intensively and extensively applied. Three avenues of approach include (1) supervision of food handlers (human carriers), (2) food inspection service (physical plant methods of preparation, holding and serving, and regulation of rodents and other animal carriers), and (3) health education through an organized program and personal contact of the departmental personnel and the public."

"Food-poisoning": A public health problem, J. C. Geiger and J. P. Gray (*Amer. Jour. Pub. Health, 23 (1933), No. 10, pp. 1039–1044*).—The emphasis in this paper on the same general subject as the one noted above is on some of the difficulties encountered in the investigation of food poisoning and the importance of educating the health officer as the most essential step in its control.

Is Salmonella food poisoning caused by living bacilli or by thermostable toxic products? E. Verder and C. Sutton (*Jour. Infect. Diseases, 53 (1933), No. 2, pp. 262–271*).—That *Salmonella* food poisoning is caused by living bacilli rather than by thermostable toxic products is indicated by the results obtained in feeding experiments conducted on human volunteers and monkeys. "Two persons who had eaten heated custard cultures of a recently isolated strain of *S. enteritidis* and five persons who had drunk heated or filtered washings from similar cultures did not become ill, though in one case the heated washings contained a few living organisms. Another person who ate a custard culture of another *enteritidis* strain, heated insufficiently to kill many of the contained organisms, became definitely ill, with diarrhea developing in 20 hours and marked prostration in 36 hours. Monkeys likewise became ill only when living organisms (*S. enteritidis*) were taken. Their symptoms were strikingly similar to those of food poisoning in man, despite variation in the severity of the reactions and lack of uniformity in the positive results."

[Nutrition studies at the Illinois Station] (*Illinois Sta. Rpt. 1933, pp. 74–77, 259–261, 271, fig. 1*).—Progress reports are given on studies under the direction of H. H. Mitchell on the relative growth-promoting property and digestibility (for rats) of the proteins of different types of cheese and the corresponding rennet-curd (pp. 74–76); by B. H. Schneider on the significance of fecal nitrogen as an indication of digestive ability and on the nutritive properties of peanut and beef protein (pp. 76, 77); by C. R. Meyer and J. M. Smith on the distribution of vitamin G in the corn kernel and the relative vitamin B potency of beef kidney, egg yolk, beef muscle, egg white, canned tomatoes, carrots, fresh milk, and apples (pp. 259, 260); by J. Outhouse and Smith on the role of lactose in nutrition (pp. 260, 261); and by Outhouse and coworkers on adjustments to inadequate dietaries and foodstuffs which should be used in greatest amounts during periods of recovery (p. 271).

The mineralization and vitaminization of milk (*Jour. Amer. Med. Assoc., 101 (1933), No. 22, pp. 1728, 1729*).—This editorial endorses the conclusions of Krauss (E.S.R., 70, p. 86) that it is unwise to attempt to fortify cow's milk with iodine, copper, or iron, but that it is worth while to increase its vitamin D content. "In the past, dependence has been placed on such antirachitic agents as cod-liver oil, viosterol, and sunshine, natural and artificial. It is not because of the ineffectiveness of these sources of vitamin D that rickets still exists. Rather, it is because of insufficient or unfaithful use of these materials, for which condition parents are probably chiefly responsible. Whatever the explanation may be, the fact remains that the incidence of rickets is still too great and will continue to be until some cheap, generally available, agreeable source of vitamin D is provided. Vitamin D milk seems to offer promising possibilities of meeting these requirements."

The calcium retention on a diet containing leaf lettuce, M. G. Mallon, L. M. Johnson, and C. R. Darby (*Jour. Nutrition, 6 (1933), No. 3, pp. 303–311*).—In this comparison at the Indiana Experiment Station of the utilization of calcium from lettuce and from milk, the same methods and subjects were used as in the earlier comparison of milk and Cheddar cheese (E.S.R., 67, p. 625). The lettuce was the ordinary strain of Grand Rapids leaf lettuce grown on sterilized soil in the university greenhouse. The milk was obtained fresh each day from the university creamery. The lettuce was consumed in quantities of 624 and 595 g daily and furnished 93 and 92.9 percent of the total calcium of the diet. Corresponding values for milk were 373 and 369 g and 88.4 and 88.3 percent, respectively. The corresponding balances were +2.6 and +3.4 mg per kilogram of body weight in the lettuce period and +0.3 and +0.6 mg in the milk period, respectively.

Notes on the occurrence of iron and copper in liver and liver extracts, H. G. Rees (*Analyst, 58 (1933), No. 688, pp. 384–388*).—A sample of fresh ox liver was found to contain 80 mg of iron and 24 mg of copper per kilogram. By extraction with water at 50° C. approximately 31.5 mg of iron and 1.75 of copper were obtained per kilogram of liver. Extraction at high temperature was less effective for the iron. The method used in the iron determinations was that of Elvehjem et al. (E.S.R., 62, p. 789) with slight modifications and for copper the Elvehjem and Lindow modification of the Biazzo method (E.S.R., 61, p. 612).

Studies on the role of zinc in nutrition, J. M. Newell and E. V. McCollum (*Jour. Nutrition, 6 (1933), No. 3, pp. 289–302, fig. 1*).—A considerable part of this paper is devoted to the description of the preparation of a practically zinc-free diet for rats and of the care of the animals to prevent access to zinc. The experiments covered growth and reproduction, with final analyses of the bodies of the experimental and control animals.

Although the basal diet seemed to be lacking in some essential to normal health, this was shown not to be zinc, as growth was not as good when additional zinc was provided. On the zinc-free diet growth was fairly satisfactory.

Normal reproduction was not obtained in the experimental animals or controls receiving zinc in addition. One of the females on the zinc-free diet had two young by a zinc-free male. The young were born alive, but were very small and did not survive, apparently from inability to suckle. The zinc content of their bodies was about one fourth that of normal stock young. The zinc content of all of the animals varied widely, but was roughly the same on the control and stock diets.

The authors conclude that "zinc is probably not an essential nutritional factor in the growth of the rat."

Comparative effect of tomato and orange juices on urinary acidity, L. G. Saywell and E. W. Lane (*Jour. Nutrition, 6 (1933), No. 3, pp. 263–270*).—Following the same methods as in the earlier studies (E.S.R., 68, p. 562), the authors have determined the effect of a standard commercial tomato juice and the juice from fresh California Valencia oranges on urinary acidity when ingested in 1,000 cc daily allowances over a 7-day experimental period following 5 days on the basal ration. Three normal young men served as subjects.

In the tests with tomato juice the pH values of the urine of the three subjects at the end of the preliminary period were 5.8, 5.4, and 5.8 and at the end of the experimental period 6.7, 6.7, and 7.1, respectively. Corresponding figures for the orange juice were 5.7, 5.85, and 5.55 at the end of the preliminary and 6.9, 6.8, and 6.5 at the end of the experimental period. The average increase in urinary pH resulting from tomato juice was 1.2 and from orange juice 1.05 units. Corresponding decreases in ammonia excretion and in total acidity, approximately the same for the two juices, were also noted. There was a marked increase in the alkaline reserve in both cases.

Attention is called to previous studies by Blatherwick on tomatoes and Blatherwick and Long on orange juice (E.S.R., 48, p. 163). In the former the tomatoes were ingested in much smaller quantities, 200- to 300-g portions, which may have accounted for the much smaller change in pH value. In the case of orange juice it is noted that the ingestion of the same quantity, 1,000 cc daily, brought about a gradual increase in pH to a final increase of 1.05 pH units, while in the studies of Blatherwick and Long daily increases in the quantity of orange juice to a total of 2,400 cc gave a final increase of from only 0.5 to 0.6 pH. The urinary pH on the basal diet alone in the experiments of Blatherwick and Long was only from 0.1 to 0.2 or 0.3 pH unit below neutrality, and consequently only a very slight increase would have been necessary to produce an alkaline urine. It is thought that the value of orange juice in lowering urinary acidity may be considerably greater than indicated by the 0.5 to 0.6 pH unit change secured by Blatherwick and Long. The more basic reaction produced by tomato than by orange juice is attributed to the higher ratio of soluble to insoluble alkalinity of the ash in the tomato.

An increase in organic acids excreted in the urine occurred on both the tomato and orange juice, the average oxidations being 90.7 and 93.8 percent, respectively.

Report of committee on nutrition, E. K. Le Fleming et al. (*Brit. Med. Jour., No. 3803 (1933), Sup., pp. 16*).—This is the report of a committee appointed by the Council of the British Medical Association on April 12, 1933, "to determine the minimum weekly expenditure on foodstuffs which must be incurred by families of varying size if health and working capacity are to be maintained, and to construct specimen diets."

In the introduction to the report the committee calls attention to the fact that although it was not a part of its duty to determine whether malnutrition is widespread or not, knowledge of the extent or absence of malnutrition among varied social groups would prove of great value in conjunction with data as to the food intakes of these groups. Regret is also expressed that "there exists no satisfactory and accepted routine method by which the nutritional condition or state of individuals can be assessed, and by which the findings of different observers can be compared. The absence of a satisfactory standard of 'normal nutrition' is probably the explanation why so many divergent opinions are expressed as to the nutritional condition of, for example, elementary school children. The usually adopted age, height, and weight ratios are open to serious objections when applied to individuals. The functional fitness of the individual needs to be studied as well as the anthropometric measurements if the true state of nutrition is to be correctly appraised."

In calculating the diets presented, the daily energy requirement per man per day has been assessed at 3,400 calories in terms of foodstuffs as purchased. The scale adopted for proportionate requirements for women and children in man values is that of Cathcart and Murray (E.S.R., 65, p. 290), the international scale noted previously (E.S.R., 70, p. 276) being considered unsuitable for Great Britain. Of the various food constituents, the quantities serving as standards are 100 g of protein (of which 50 are of first quality), 100 g of fat, and 500 g of carbohydrate per man value per day. No quantitative recommendations are given for vitamins or minerals. Concerning the former, the statement is made that the best possible safeguard against a shortage is insistence on as great a variety of foodstuffs in the diet as possible, with the invariable inclusion in it of dairy products and fresh fruits and vegetables. However, in the specimen diets given, an allowance of only 1d. per man value daily is made for the purchase of fresh fruits and green vegetables. Specific recommendations for milk include 1 pt. daily for children from 1 to 5 and ½ pt. from 5 to 10 years of age. These allowances are considered to constitute "a sufficient and safe quantity, but more could be given with advantage. Beyond the age of 10 years the consumption of milk by children is desirable but not essential provided the diet is adequate and well balanced."

For food prices two scales were used, one of which is referred to as the B.M.A. and the other as the Stockton scale. The first is based on prices of 50 foods in markets used by the working classes, collected in June 1933 for the committee by medical health officers in various parts of the country, and the second on detailed records of the prices of foodstuffs extending over a period of 1 year from the cheapest markets in Stockton-on-Tees. The prices in the latter scale are considerably lower than in the former.

Sixteen specimen diets are given with the quantities of different foods, their prices according to the two scales, grams of protein, fat, and carbohydrate, and calories furnished by each item per week, with total values per day. The first diet is a bare ration with no variety, the second a somewhat better ration based on 50 g of first-class protein and containing ¼ pt. of milk. These two and a third containing no meat or fish are in terms of man values. The estimated costs per man per week in terms of the B.M.A. and Stockton scales were 58.25 and 45, 70.5 and 59.75, and 71.5 and 60.25d., respectively. These are followed by diets for children in the various age groups and families of varying composition. It is noted that the diets of the children are relatively more costly per unit of energy than the adult diet. A table is given showing the comparative man value calorie and cost efficients based on the cost of the second of the sample diets given, as follows: Adult male and boy over 14 yr., man value calorie coefficient and mean cost coefficient 1 each; adult female and girl over 14 yr., 0.83 and 0.83; child from 12 to 14 yr., 0.9 and 0.9; from 10 to 12 yr., 0.8

and 0.8; from 8 to 10 yr., 0.7 and 0.71; from 6 to 8 yr., 0.6 and 0.6; from 3 to 6 yr., 0.5 and 0.59; from 2 to 3 yr., 0.4 and 0.54; and from 1 to 2 yr., 0.3 and 0.47, respectively. Appendixes are given on food values and prices, together with a glossary of terms.

The feeding of the nation (*Brit. Med. Jour., No. 3803 (1933), p. 980*).—In this editorial comment on the report noted above, the only suggested criticism is that some of the figures upon which the diet calculations were based "may be attacked as too generous—for example, the allowance of 3,400 great calories per day per adult male." Concerning this point, it is noted that the figures are for gross calories purchased, and that with an allowance of 10 percent loss for unavoidable waste the net figure for intake is reduced to 3,060.

Sane nutrition standards, K. Daum (*Med. and Prof. Woman's Jour., 40 (1933), No. 9, pp. 247-249*).—This is a general discussion of present-day standards for proteins, minerals, energy, and vitamins, chiefly in terms of food selection and allowances. "The menus, which include the essentials of an adequate diet, will include 1 pt. to 1 qt. of milk daily used as a beverage and in foods, 1 to 2 eggs, 1 serving of meat and a second of meat, egg, or meat substitute, fruit twice daily, 2 green vegetables with potatoes, bread and butter, and sugar to make up the required calories."

Family diet coefficients, M. L. Clark (*Brit. Med. Jour., No. 3803 (1933), pp. 977-979*).—Attention is called to the lack of uniformity in the various scales of family coefficients which have been proposed for use in dietary calculations, and a study is reported of the distribution of calories, protein, fat, and carbohydrates, together with the percentage of total calories derived from bread, in the food consumed for a period of 2 days by the individual members of 16 families in London totaling 81 persons, including 49 children ranging in age from 16 yr. to 3 mo. The families had already kept budget and diet sheets for 2 weeks in connection with another investigation.

In the plan followed, the mother recorded after each meal during 2 days the individual consumption of each food in terms of convenient measures. In translating these measures into quantities, the entire weight of the food in question purchased or on hand at the beginning less the amount remaining was divided by the total number of measures used, and the proportion of the whole eaten by each member of the family was calculated from the number of servings or measures recorded. Prepared dishes were given the total food value of the stated quantities of their various ingredients, and calculations were made from these.

The data combined for ages are treated and discussed in several ways. The proportions of total calories consumed by various members of the family were calculated, with the number of samples upon which the figures are based and the consumption unit for each group, as follows: Father 14 samples and 1; mother 14 and 0.71; boy 14 and over, 1 and 0.9; girl 14 and over, 3 and 0.74; child 12 to 14, 6 and 0.87; 10 to 12, 11 and 0.75; 8 to 10, 5 and 0.67; 6 to 8, 5 and 0.62; 3 to 6, 8 and 0.57; 2 to 3, 1 and 0.26; 1 to 2, 1 and 0.46; and under 1, 1 and 0.15.

It is noted that the figure 0.71 for the adult woman tallies with that actually found by Cathcart and Murray in their study of the individual diets of 5 families (E.S.R., 65, p. 290) rather than with the commonly accepted figure 0.83, and that the figures for children of the ages for which there were more than 1 or 2 samples were very close to the Cathcart scale.

Calculations of the man value per 100 persons of the individuals in the present study, according to various scales, gave the following values: Atwater scale 68, Inter-Allied 79, Cathcart 77, International 70, and the present study

80. The average man values per family of the 16 families were 3.898 according to the Cathcart scale, 3.563 for the International, and 4.053 for the present scale. The difference between the Cathcart and present values was not statistically significant, but between each of these and the International scale the differences were statistically significant. The results in the present study are thought to be of sufficient value to form with the Cathcart and Murray data "the basis of a new set of family coefficients based on actual observations."

Symposium on basal metabolism (*Ohio Jour. Sci., 33 (1933), No. 5, pp. 295–424, pls. 2, figs. 9*).—This symposium consists of a series of lectures given before the Ohio State Chapter of the Society of Sigma Xi in 1932–33. The papers and authors are as follows: The Development of Methods for Determining Basal Metabolism of Mankind (pp. 297–310) and Problems in the Determination of the Basal Metabolism of Man and Factors Affecting It (pp. 315–334), both by T. M. Carpenter; Some Aspects of Carbohydrate Metabolism, by J. R. Murlin (pp. 335–358); Fat Metabolism, by J. B. Brown (pp. 359–371); The Role of Proteins in Metabolism, by W. C. Rose (pp. 372–388); Critical Situations in the Mineral Metabolism of Human Beings and Domestic Animals, by E. B. Forbes (pp. 389–406); and Metabolism and Disease, by G. M. Curtis (pp. 407–424).

History of infant feeding, A. B. Lyon (*Amer. Jour. Diseases Children, 46 (1933), No. 2, pp. 359–374*).—This is a historical account of the development of artificial feeding of infants.

Vegetable feeding in the young infant: Influence on gastro-intestinal motility and mineral retention, F. W. Schlutz, M. Morse, and H. Oldham (*Amer. Jour. Diseases Children, 46 (1933), No. 4, pp. 757–774, figs. 10*).—This paper includes a review and discussion of the conflicting literature on the cause of the favorable effect of vegetable additions in infant feeding and the report of a series of metabolic studies on a group of four normal healthy infants whose ages ranged during the course of the experiment from 5 weeks to 6 months. In all, four series of experiments were conducted to determine the effect of dried, five of purèed, and one of raw spinach, and five each for Cellu-flour and an artificial salt mixture approximating the salt content of the spinach. For any given supplement, a series of three metabolism periods was run, the first a control period of 6 days on a milk formula only, the second a 3-day period following the addition of the supplement, and the third a 6-day period on the supplement following immediately the 3-day period. The balances determined included nitrogen, sodium, potassium, calcium, magnesium, iron, chlorine, phosphorus, and sulfur.

The data presented show that the feeding of spinach in any form did not increase the retention of any of these elements. There was a slight indication of decreased retention of calcium and iron on the dried spinach which could not be attributed to bulk, as this was not true of the diets furnishing Cellu. The feces were increased in bulk on both spinach and Cellu-flour, but peristalsis was not affected.

The authors conclude that "if the various forms of spinach which we used can be taken as typical of vegetable feeding, our data indicate that the beneficial effect of the addition of vegetable matter to the dietary of the young infant cannot be attributed either to an improved mineral retention or to an increased gastro-intestinal motility. Perhaps the vitamin effect of the vegetable is the sole factor responsible for the increased well-being of the infant to whom it is fed."

Nutrition and child-bearing, E. Mellanby (*Lancet* [*London*], *1933, II, No. 21, pp. 1131–1137*).—The factors discussed as being among the most important, both to the mother and offspring, of the food essentials at present known are calcium, phosphorus, iodine, iron, and vitamins A and D. Recommendations for diet in pregnancy and lactation include "2 pt. of milk daily; 1 or 2 substantial servings of green vegetables—cabbage, spinach, or lettuce daily; 1 or 2 eggs or egg yolks daily; an apple or orange or some fresh fruit daily; sea fish twice or more a week; calf's liver once a week. If cod-liver oil can be taken, 2 teaspoonfuls daily is advisable."

Concerning infant feeding, the author states with emphasis that "complete breast feeding with a well-fed mother up to the end of 9 months of extra-uterine life, followed by a diet containing 1½ pt. to 2 pt. of cow's milk for the first 3 or 4 years and longer, if possible, and not less than a pint daily after this, will do more to eliminate the need of dentistry than all the dental hygiene—tooth brushes, tooth pastes, and mouth washes—in the world."

Cod-liver oil is recommended for its content not only of vitamins A and D but of iodine. "Indeed, cod-liver oil is probably the greatest single nutritional factor, next to milk, in preventive medicine that the human race has ever possessed."

Seasonal variation of average growth in weight of elementary school children, C. E. Palmer (*Pub. Health Rpts.* [*U.S.*] *48* (*1933*), *No. 9, pp. 211–233, figs. 5*).—This is the first of a series of papers covering an investigation conducted by the U.S. Public Health Service, in cooperation with the School of Hygiene and Public Health of the Johns Hopkins University, of certain general problems connected with the physical growth of elementary school children.

The material for the study consisted of monthly weighings (in indoor clothing without shoes, vests, sweaters, or coats) of approximately 2,500 native-born white children from 6 to 16 yr. of age. The weighings were begun late in September and completed late in May for each of the school years from 1923 to 1927, inclusive. In the first year the children in the first four grades were weighed, and in each succeeding year the lowest grade of the year before was dropped and a higher one added. Statistical treatment was made of the following data: Actual weight on October weighing day, weight increments for separate months of the school year, and weight increments for the summer vacation period.

Maximum rates of average growth in weight occurred during the fall months, intermediate during the winter, and minimum during spring, with the average rates during the summer approximately equal to those in February and March. These changes were observed in both sexes and in all age groups.

The growth rates of the boys and girls were practically the same during the sixth and seventh years, but were higher for the boys during the eighth and ninth years and for the girls from the spring of the tenth year to the fall of the fourteenth year, after which the rates for the boys became greater. Maximum growth rates for the girls occurred in the eleventh and twelfth years and for the boys in the fourteenth and fifteenth years. There was no evidence of a pre-adolescent lag in growth in weight. The adolescent acceleration in weight gains was more pronounced in the spring and summer for the girls and in the fall and early winter for the boys.

Contrary to the suggestion of Emerson (E.S.R., 58, p. 190) that the typical seasonal growth rate is the result of including in the data records of children who failed to gain or who lost weight due to illness, a comparison of the monthly growth rates of a selected group of children who were not absent from school during an entire year with the other children in the group who were absent one or more days because of sickness showed that the records of the children who had been out of school did not affect the typical seasonal variations.

A list of 28 references to the literature is appended.

Variations of growth in weight of elementary school children, 1921–28, C. E. Palmer (*Pub. Health Rpts.* [*U.S.*], *48* (*1933*), *No. 33, pp. 993–1005, figs. 3*).—Using the same records as in the study noted above, together with similar records for 1921–23, the author has made a statistical study of the fluctuations of annual growth in weight of elementary school children during these years for the purpose of determining (1) the range of normal variation in weight gains in successive years in order to evaluate the effectiveness of public health activities, (2) the cumulative effect upon the growth and final size of the body of a succession of particularly favorable or unfavorable growing years, and (3) unconsidered sources of variations requiring study. The general conclusions drawn are summarized as follows:

"With the exception of a few groups, the average weights of children of given age did not vary significantly from year to year during the 7-year period. Average annual weight increments showed a systematic and statistically significant fluctuation during the 7-year interval. The most divergent year, May 1924 to May 1925, was found to be an inferior 'growing' year, weight increments averaging approximately 92 percent of the standards based on 7 consecutive annual measurements. The best 'growing' year, 1926–27, showed an average increment of over 105 percent of the 7-year standards."

Growth and the economic depression, C. E. Palmer (*Pub. Health Rpts.* [*U.S.*], *48* (*1933*), *No. 42, pp. 1277–1292, figs. 5*).—For the purpose of determining whether or not the economic depression has affected the weights of school children in small urban communities, the data obtained in the two studies noted above have been compared with weight records taken in the same city in May 1933 of 1,269 girls and 1,245 boys from 6 to 11 yr. of age. The data used from the earlier study consisted of the calculated mean weights in May for the combined years from 1921 to 1927.

The average weights of the children in the two periods showed no consistent or statistically significant differences. The variability in body weight, as measured by standard deviation, was not significantly different in the two periods for the boys, but was slightly greater for the girls in 1933 than in 1921–27. In the 1933 totals there were 4 fewer boys and 41 more girls who were 12 percent or more below average weight than would have been expected if the same proportion had been underweight as were in the 1921–27 period. "From these findings it may be concluded that there is substantially no change in the weight of boys, and a slight increase in the number of underweight girls, during the last few years of the economic depression."

It is noted that the charitable work in the city in which this study was made is in the hands of a highly competent and efficient organization, and that few families with children are being denied the elementary necessities. Free noonday lunches are given to all really needy children attending the elementary schools. A classification of the children weighed in 1933 on the basis of unemployment, part-time employment, and full-time employment in their families, with subsequent analysis of the weights of the children in these groups, showed approximately the same differences generally found among children of these groups. Another classification of the children into two groups of those directly and indirectly receiving aid from charity funds and those not receiving such aid showed lower average weights in the former group, thus suggesting that the children who are most in need of supplementary aid are probably receiving it.

Preventing loss of weight in the new-born, I. N. Kugelmass, R. E. L. Berggren, and M. Cummings (*Amer. Jour. Diseases Children, 46 (1933), No. 2, pp. 280–308, figs. 8*).—Following a discussion of the nature and probable causes of loss in weight in the new-born, a procedure is described for preventing these losses by the administration at 2-hour intervals throughout the first 24 hours of life of a solution consisting of 6 percent gelatin (pH 6.2), 3 percent dextrose, and 0.5 percent sodium chloride. "The gelatin hydrates blood and tissues; it raises body heat by virtue of its specific dynamic action, and it reduces the clotting time. Dextrose brings the hypoglycemia of the new-born to normal. Sodium chloride raises the initial low blood chloride and favors hydration."

Physical impairment and weight, R. H. Britten (*Pub. Health Rpts.* [*U.S.*], *48 (1933), No. 31, pp. 926–944, figs. 3*).—This is a brief summary of the results of a study conducted as a part of an extensive series of studies on the diseases of adult life by the division of research of the Milbank Memorial Fund in co-operation with the U.S. Public Health Service. The data used for the analysis are the records of health examinations of life insurance policyholders who had accepted the offer of certain life insurance companies for examination without cost by physicians of the Life Extension Institute. For comparison, data from an extensive investigation by life insurance companies are included on the relationship between weight and mortality and annual death rates by cause according to weight in three age groups at the issuance of insurance.

The latter data show a great excess mortality among overweight persons whatever their age and also an excess among young adult underweight persons. Of the diagnoses included, tuberculosis was the only one showing any marked excess mortality among underweight persons, while a large number of causes of death, primarily degenerative, showed an excess among the overweight. The examination of defects and impairments in the health examination records showed similar relations. "On the underweight side, tuberculosis stands out most clearly; on the overweight side, degenerative conditions, especially as indicated by urinalysis findings and high blood pressure."

Normal development of teeth associated with enforced dietary restrictions as the result of congenital stricture of the esophagus, L. T. Austin and P. P. Vinson (*Jour. Amer. Dental Assoc., 20 (1933), No. 8, pp. 1498–1500, figs. 4*).—A case report is given, with photographs and dental roentgenograms, of a man 23 years of age whose diet on account of a congenital stricture of the esophagus had consisted chiefly of milk, with the addition of cocoa and Cream of Wheat made into a thin gruel. The general condition of the subject was good, and his teeth were unusually good with unbroken enamel and no caries.

The significance of vitamins in practical experience, L. J. Harris (*Brit. Med. Jour., No. 3790 (1933), pp. 367–373*).—This lecture, opening a discussion of diseases of children at the 1933 meeting of the British Medical Association, is confined almost entirely to vitamin D which, in the author's opinion, is by far the most important of the vitamins to consider from a practical point of view in the British Isles. The topics discussed include the prevalence of rickets, merits of different prophylactic methods, public health measures, curative treatment with special emphasis on avoidance of hypervitaminosis D, vitamin D therapy apart from rickets, and vitamin D and the parathyroid.

Irradiated ergosterol is considered the most certain remedy, both in prophylactic and in curative treatment, but it is emphasized that care should be taken in its administration to adhere strictly to the correct dosage. A dose of 1,500 international units a day is provisionally recommended for ordinary prophylactic use and from 3,000 to 5,000 for curative treatment of infants and young children. The minimal toxic dose for infants is placed at about 10,000 international units.

The importance of vitamins A and B is rather minimized, as will be seen from the following abridged statement of the author's conclusions concerning these factors: "Vitamin A cannot be regarded as a general anti-infective agent. Although we have no evidence of any widespread deficiency of it in this country in any way comparable to that of vitamin D, it is still advisable to insure that diets are adequately provided with it. The offspring receives but a moderate amount prenatally and in the milk. The effect of extra vitamin B added to the infant's diet requires further study. There is no compelling evidence to support the suggestion that the prevalence of constipation and stasis is due to lack of this factor."

Summarizing present theories concerning the mode of action of the vitamins, the author states that the primary effect of a deficiency of vitamin A is a characteristic abnormality in certain cell structures, especially mucous membrane cells and nerve cells; of vitamin B, a derangement of carbohydrate metabolism with accumulation of lactic acid which causes a slowing of the heart and in the central nervous system convulsive symptoms; of vitamin C, a failure in the function of certain highly active cells; and of vitamin D, a disturbance in calcium and phosphorus metabolism.

Natural and induced variations in the vitamin values of milk, H. C. Sherman (*Amer. Jour. Pub. Health, 23 (1933), No. 10, pp. 1031–1034*).—This brief discussion of vitamin values in milk as produced under the most favorable conditions was presented at the 1933 meeting of the American Public Health Association.

Nutrition studies of foodstuffs used in the Puerto Rican dietary.—VI, The vitamin A content of pasteurized milk and native cheese, D. H. Cook and J. H. Axtmayer (*Puerto Rico Jour. Pub. Health and Trop. Med., 9 (1933), No. 1, pp. 90–92; Spanish abs., p. 92*).—In this continuation of the series noted previously (E.S.R., 69, p. 617), determinations by the usual method were made of the vitamin A content of pasteurized milk from a distributing plant obtaining its supply from a large portion of the Island of Puerto Rico, and of locally purchased cheese made from whole milk. The values obtained approximated those published in the literature, the milk having a vitamin A value of 2 units per cubic centimeter and the cheese 20 units per gram.

The need of a greater supply of cheap milk for the island is thought to be a problem of great importance. "That this is recognized is evidenced by the maintenance of milk stations for infant feeding partially financed by philanthropic institutions in the North. Due to the present economic situation much of this valuable work has had to be abandoned, and therefore the burden of supplying milk for the people must be assumed by the local agencies."

Preliminary note on the occurrence of vitamin A in the oil of West Indian sharks, C. F. Asenjo (*Science, 78 (1933), No. 2030, p. 479*).—This is a brief note stating that oil from the livers of two West Indian sharks, caught near Puerto Rico, in doses of 1 mg daily induced in rats an average growth rate of more than 24 g in the 8-week period following depletion on the vitamin A-free diet.

The carotenoids of the apricot (Prunus armeniaca) [trans. title], H. Brockmann (*Hoppe-Seyler's Ztschr. Physiol. Chem., 216 (1933), No. 1–2, pp. 45–48*).—From dried apricots the author has isolated in crystalline form β-carotene, together with a small proportion of γ-carotene. From the quantity isolated the apricot is considered to be the richest fruit source of carotene, and consequently an exceptionally good source of vitamin A.

The incisor teeth of albino rats and guinea pigs in vitamin A deficiency and repair, S. B. Wolbach and P. R. Howe (*Amer. Jour. Path., 9 (1933), No. 3, pp. 275–294, pls. 13*).—This paper reports the histological findings in an extension of an earlier study of the effect of vitamin A deficiency on the incisors of white rats (E.S.R., 54, p. 891) to the sequences of repair during recovery following the addition of butterfat to the deficient diet, and a study of the incisors of guinea pigs during subsistence on a diet relatively low but not completely lacking in vitamin A. The report is illustrated by a series of microphotographs of frontal plane sections of the incisors.

The initial effect of vitamin A deficiency on the incisors of both rats and guinea pigs is upon the enamel organ, described as follows: "The ameloblasts respond earliest by atrophy, then the remainder of the organ atrophies; finally metaplasia and calcification, and, in the guinea pig, ossification occur. Atrophy and depolarization of odontoblasts follow enamel organ changes."

In repair the same sequence is followed, the restoration of the enamel organ taking place first, followed by recovery of the odontoblasts in juxtaposition to the enamel organ, with rapid calcification of the dentine. Excessive local formation of atypical dentine is produced in vitamin A deficiency by focal responses of the pulp cells. These deposits are insignificant at first but increase in the recovery period, as does another type initiated by the presence of cells of the enamel organ that become incorporated by folds of dentine or through gaps in the dentine. These denticles are of particular interest as suggesting an explanation for pulp stones in human teeth. In the opinion of the authors "vitamin A deficiency is the most important because of its effect upon the enamel organ, and because recognition of this deficiency is always late and will continue to be so unless other criteria than ocular effects are looked for by pediatricians. Defective enamel formation, ossification of the pulp, denticle and cementicle formation are all possible consequences of vitamin A deficiency in humans."

Studies in the physiology of vitamins, XXI, XXII, G. R. Cowgill and M. L. Palmieri (*Amer. Jour. Physiol., 104 (1933), No. 2, pp. 484–488; 105 (1933), No. 1, pp. 146–150*).—In continuation of the series of studies noted previously (E.S.R., 68, p. 417), two papers are presented.

XXI. *The effect of water administration on the development of anorexia and polyneuritic symptoms in pigeons subsisting on a diet lacking the vitamin B complex.*—Evidence is given showing that the administration of large volumes of water by mouth to pigeons on a diet deficient in vitamin B (B_1) is without appreciable influence on the time required for the development of loss of appetite. A slight delay was noted in the appearance of neuritic symptoms following administration of large volumes of water, but the delay was so slight that it was considered insignificant.

These results are in accord with those of Marrian et al. on pigeons (E.S.R., 58, p. 893), but do not agree with those of Cowgill et al. on dogs (E.S.R., 66, p. 198). In explanation of this discrepancy, the possibility is suggested that in the dog the diuresis resulting from the administration of water causes a washing out of vitamin B from the organism.

XXII. *The effect of experimentally-induced hyperthyroidism on the vitamin B requirement of pigeons.*—"In a group of 12 pigeons subsisting on a diet adequate except with respect to the vitamin B complex, the minimal amounts of a yeast vitamin B concentrate required daily for mainenance of a practically constant body weight were determined. Hyperthyroidism was then induced experimentally in each of the birds by the daily administration of 100 mg of desiccated thyroid tissue, and the amount of vitamin B concentrate required for body weight maintenance was again determined. In every case the vitamin B requirement proved to be greater in hyperthyroidism than under 'normal' conditions. It is concluded that in the pigeon, as in the dog [E.S.R., 67, p. 633], there is some relation between the amount of vitamin B required for maintenance of body weight and the metabolism of the organism."

Fresh and dried yeast as sources of vitamin B, R. WALKER and E. M. NELSON (*Amer. Jour. Physiol., 103 (1933), No. 1, pp. 25–29, fig. 1*).—In feeding tests on rats the vitamin B (B_1) potency of a fresh compressed yeast cake was found to be approximately half that of a similar cake which had been dried at room temperature before an electric fan. One eighth of a cake of fresh yeast, 1/16 of a dried cake of the same material, and a sample of hard wheat equal in weight to 1/16 of a fresh yeast cake were found to be approximately equal in their total vitamin B content. As yeast preparations most potent in vitamin B were found to contain the lowest proportion of viable yeast cells, it is suggested that the lower value of the fresh yeast may be due to the resistance of the live yeast cells to digestion.

Influence of the B vitamins on the content of glycogen and glutathione in the liver of rabbits [trans. title], M. LABBÉ, F. NEPVEUX, and J. D. GRINGOIRE (*Compt. Rend. Soc. Biol. [Paris], 113 (1933), No. 18, pp. 152–155*).—Comparable groups of rabbits were fed for a month diets with and without additional vitamin B in the form of a special vegetable product, and were then killed and their livers analyzed for glycogen and glutathione. The livers of the animals receiving no vitamin B supplement contained 2.14, and of those receiving vitamin B 5.05 g of glycogen per 100 g of body weight. Corresponding values for glutathione were 0.243 and 0.317 g per 100 g, respectively. It is concluded that the B vitamins play an important role in carbohydrate metabolism favoring glycogenesis and increasing the content of the liver in oxidizing-reducing substances.

Reducing property of aqueous humour, H. K. MÜLLER (*Nature [London], 132 (1933), No. 3329, pp. 280, 281*).—Previously observed properties of the aqueous humor of cattle and rabbits' eyes corresponding with known properties of vitamin C are summarized, and unfinished experiments are reported suggesting that the vitamin C of the aqueous humor stands in close relationship to the metabolism of the lens. It is thought that the lens either secretes the vitamin C into the aqueous humor or reduces some component of the aqueous humor already present. A connection between vitamin C and cataract is suggested from observations that within four hours after oral administration of naphthalene in doses sufficient to cause cataract the capacity of the aqueous humor to reduce iodine disappears, that the capacity of the aqueous humor-trichloracetic acid filtrate to combine with iodine is considerably diminished in the case of cattle afflicted with cataract, and that young cataracts can be ripened by puncturing the aqueous humor.

The evaluation of the phosphorus deficiency of the rickets-producing diet, A. T. SHOHL, H. B. BROWN, E. E. CHAPMAN, C. S. ROSE, and E. M. SAURWEIN (*Jour. Nutrition, 6 (1933), No. 3, pp. 271–284, fig. 1*).—Young rats were maintained for long periods on the Steenbock-Black rachitogenic diet 2965 supplemented with 2 g of cod-liver oil for each 100 g of the diet. Metabolism experiments were conducted at different times during the experimental period. In the first series the animals were killed at the age of 170 days and in the second of 133 days. Litter mates fed the Sherman diet B served as controls. The observations included X-ray pictures, weight increases, blood serum content of calcium and phosphorus, bone analyses, and calcium and phosphorus metabolism data, with final analyses of the total bodies for calcium and phosphorus.

The X-ray figures showed that the bones were normal, but smaller and thinner than those of the controls. Increases in weight were much less than in the controls. Inasmuch as it had previously been shown that the diet permits good growth when phosphate is added (E.S.R., 59, p. 895), the conclusion is drawn that phosphorus is the limiting factor for growth in the diet.

Calcium levels in the serum remained normal in the experimental animals. Phosphorus was slightly lower than in the controls, but above the level found in rickets. The actual weights of the bones of the experimental animals were considerably less than of the controls, but the proportions of calcium to phosphorus were the same. The metabolic data showed high calcium-low phosphorus retention, but the ratio of total body calcium to phosphorus was essentially the same in the experimental and control animals.

In attempts to explain the divergent results of the calcium and phosphorus retentions, as determined by metabolism experiments and by body analyses, the authors state "the experimental animals are still laying down bone as rapidly as the limiting phosphorus in the diet permits, whereas the normal animals have reached complete development of their skeleton and have no longer a need for extra calcium. As far as bone deposition is concerned, the experimental animals are growing and the normal animals are adult."

Rickets and hyperparathyroidism, B. Hamilton and C. Schwartz (*Amer. Jour. Diseases Children, 46 (1933), No. 4, pp. 775–785, fig. 1*).—Data are presented showing that a large dose of calcium chloride or calcium gluconate, given by mouth, causes a much more marked rise in the serum calcium of rachitic than of normal rabbits, and that the blood of rachitic rabbits is abnormally high in parathyroid hormone, as determined by a simple test which is described briefly.

Effect of lactose on rickets in rats, G. Sunderlin (*Amer. Jour. Diseases Children, 46 (1933), No. 4, pp. 786–793, fig. 1*).—In this contribution from the Louisiana Experiment Station, lactose is shown to have a definite prophylactic effect against rickets in rats when added to the Steenbock rachitic diet to the extent of 25 percent of the diet. A similar beneficial effect was not noted in curative tests.

"The fact that chemically pure lactose, a substance free from minerals and vitamin D, has any effect on the severity of the rachitic condition of rats points to a relationship between the reaction of the contents of the intestinal tract and rickets. On the other hand, it is noted that while lactose maintains the fecal pH at nearly as low a level as does cod-liver oil, it has decidedly less prophylactic effect against rickets. This indicates that the intestinal pH, with its effect on the solubility of calcium and phosphorus, is only one of the factors in the eitology of rickets."

Clinical effectiveness of a cod liver oil concentrate, D. J. Barnes (*Amer. Jour. Diseases Children, 46 (1933), No. 2, pp. 250–261, figs. 3*).—Clinical tests are reported on the treatment of rickets with a corn oil solution of a cod-liver oil concentrate of such potency that at the lowest dosage given, 6 drops daily, the subjects received 4,000 units of vitamin D and 10,000 units of vitamin A. Doses of 12 and 18 drops, respectively, were also given. The medication caused no dietary disturbances, growth proceeded at a normal rate, and healing was rapid in all cases.

A sensitive test for subclinical scurvy in man, G. Dalldorf (*Amer. Jour. Diseases Children, 46 (1933), No. 4, pp. 794–802, figs. 5*).—This paper summarizes methods reported in the literature for determining capillary resistance, describes with illustration a capillary resistometer which the author has used in tests of subclinical scurvy, and reports and discusses results obtained in a series of tests on adults and children and the value and limitations of the test.

The greatest limitation in the practical use of the test is considered to be the great variations among different people in response to the test. "This limitation, however, does not destroy the usefulness of the test. It may still be used when single readings are made on groups large enough to submerge the individual differences, and it may yield significant results in individual cases when repeated readings are made. Furthermore, in many cases negative or strongly positive readings conclusive in themselves will be secured."

Readings illustrating the application of the method under various conditions are given. Of particular interest is the record of rapid increases in capillary resistance as shown by daily readings in two children in early days of hospitalization on a good diet following subsistence on diets largely devoid of vitamin C. The diet administered contained as sources of vitamin C a daily average of approximately 100 cc of orange or tomato juice in addition to 1 qt. of milk and a daily ration of potato.

Diet of tuberculous and nontuberculous children: Effect of increased supply of vitamin B concentrate and minerals, P. D. Crimm, I. J. Raphael, and L. F. Schnute (*Amer. Jour. Diseases Children, 46 (1933), No. 4, pp. 751–756, fig. 1*).—Increased gains in weight of tuberculous children noted following the addition to the diet of the special cereal mixture of Tisdall et al. (E.S.R., 64, p. 391) are shown to be due to the vitamin B of the cereal rather than the mineral addition, while increased hemoglobin is attributed to the mineral addition. This was determined by a comparison of the weight gains and changes in hemoglobin of groups of children with latent or suspected tuberculosis following the addition of a special vitamin B concentrate and the mineral mixture to a diet containing farina and by the substitution of the special cereal for the farina.

The treatment of pernicious anemia with duodenal juice [trans. title], W. Kühnau (*München. Med. Wchnschr., 80 (1933), No. 45, pp. 1772, 1773*).—Favorable results are reported in the treatment with normal duodenal juice of cases of pernicious anemia which had proved refractory to liver treatment. The juice was administered three times a week in doses of from 100 to 200 cc, or from 40 to 200 cc at weekly intervals over a longer period.

A note on the incidence of endemic goiter in northeastern Germany, R. Olesen (*Pub. Health Rpts. [U.S.], 48 (1933), No. 35, pp. 1074–1081, figs. 2*).—During the course of routine physical examinations at Berlin, Germany, of applicants for immigration visas, examinations for thyroid enlargement were made on 1,976 males and 2,320 females of different ages, following the same methods of examination and classification as in previous surveys (E.S.R., 64, p. 595).

The results of the survey showed that endemic goiter prevails to a considerable extent in northeastern Germany, especially among girls and women. Nearly 3 percent of all of the females examined had goiters of adenomatous character, and evidences of toxicity were noted in 14.7 percent of these cases.

Attention is called to the fact that the percentage incidence of goiter in northeastern Germany is definitely higher for both sexes than that found in the previous survey among corresponding groups of people in Northern Ireland, although considerable areas of both countries are adjacent to the sea.

Endemic goiter in Switzerland, R. Olesen (*Pub. Health Rpts. [U.S.], 48 (1933), No. 23, pp. 651–665*).—This review of recent contributions to the etiology, incidence, and prevention of endemic goiter in Switzerland is based chiefly upon an official publication of the Swiss Department of Public Health reviewing the findings of the Swiss Commission for the Prevention and Cure of Goiter, and the report of the International Conference on Goiter held in Berne, Switzerland, in August 1927.

Distribution of mottled enamel in the United States, H. T. Dean (*Pub. Health Rpts. [U.S.], 48 (1933), No. 25, pp. 703–734, figs. 3*).—This paper reports the results of a survey conducted by means of the distribution of questionnaires among district or local dental societies and individual dentists, together with a detailed survey by the author in certain sections of the country. The special points of interest brought out in the returns of these surveys are presented by States, and a map is included showing (1) 97 areas reported in the literature on the basis of dental surveys or areas reported by questionnaire and confirmed by survey, (2) 28 areas reported in the literature not based on the survey, (3) 70 areas reported by questionnaire but not yet confirmed by an extensive survey, and (4) 5 questionable areas.

A list of 28 references to the literature is appended.

Hyperinsulinism, a definite disease entity, S. Harris (*Jour. Amer. Med. Assoc., 101 (1933), No. 25, pp. 1958–1965, figs. 4*).—This paper outlines the etiology, pathology, symptoms, diagnosis, and treatment of hyperinsulinism, a condition first described by the author as a disease entity in 1924 (E.S.R., 53, p. 368).

Attention is called to the possibility that a patient with hyperinsulinism may later become diabetic, and the importance is emphasized of early diagnosis and dietary management. "It is just as necessary to teach the patient with hyperinsulinism food values and to calculate and arrange the menus suited to his particular case as it is to teach 'diabetic arithmetic' to patients with hypo-insulinism (diabetes mellitus)."

Dietary recommendations are given in terms of calories, protein, carbohydrate, and fat.

Dietary and medical management of diseases of the gallbladder, J. R. Twiss and C. H. Greene (*Jour. Amer. Med. Assoc., 101 (1933), No. 24, pp. 1841–1847*).—Included in this report are five diet lists for use in the treatment of gall-bladder disease. The general principle of a bland diet is followed in each of the lists. Diet 1 is of low cholesterol, low fat, low caloric content; diet 2 low cholesterol, low fat, high caloric; diet 3, bland, low cholesterol for gastric hyperacidity; diet 4, high cholesterol, low caloric; and diet 5, high cholesterol, high caloric content.

HOME MANAGEMENT AND EQUIPMENT

[Home accounts for farm and small town families] (*Illinois Sta. Rpt. 1933, pp. 265–270, fig. 1*).—The findings are given of an analysis by R. C. Freeman and P. Nickell of 159 farm and 33 town family records obtained in 1932. Among the findings reported are the averages for the years 1930, 1931, and 1932 for cash income available for family use, value of commodities furnished by the farm, amount spent for different groups of goods and services and realized income, and the average distribution of realized income in different income groups. Comparison is made of the expenditures of 56 identical farm families for the years 1930, 1931, and 1932. A table shows the distribution of the average expenditures in 1932 of 47 farm families with realized income of $500 to $999, grouped by size of family.

A study of five commercial electric stoves, A. E. Baragar and E. B. Snyder (*Nebraska Sta. Res. Bul. 68 (1933), pp. 62, figs. 45*).—Five commercial electric stoves having major variations in types of surface units, in the construction, lining, and insulation of the oven, and in the retail price were studied to determine (1) the efficiency and time of heating of the various surface units and (2) the merits of differently constructed ovens.

The efficiency and time of heating for both cold and hot starts for short-time tests of three types of surface units, namely, open type, solid cast type, and tubular or ring type solid, were found by heating successively 4, 3, 2, and 1 lb. of distilled water from 72° to 206° F. in various sizes and types of covered and uncovered aluminum and enameled pans. For long-time tests for both cold and hot starts the efficiency was found by heating 4 lb. of distilled water in covered aluminum and enameled pans from 72° to the boiling point, after which the water was kept boiling for the remainder of the one-hour test period.

The results of the surface-unit tests indicated that units having a small watt rating are more efficient than units having a large watt rating. The tubular and the ring-type units are the most efficient for general use. Some open units were more efficient than others. The cone and reflector units are efficient for short-time processes when started cold, but for all other processes they are inefficient when compared with the other open-type units studied. The solid cast units are inefficient for cold starts, but for long-time processes they are very efficient. The utensils should have straight side walls, should not be too high, and should be of a size to fit the unit exactly. The cover should make perfect contact with the side walls. For short-time processes either enameled pans or black-bottomed aluminum pans should be used on open and tubular or ring-type units. For all solid cast units, aluminum pans with bottoms making perfect contact with the unit should be used. For all long-time processes aluminum pans should be used on all units.

The ovens were rated by determining and comparing, for empty ovens, (1) the time and energy required to preheat, (2) the total heat loss, (3) the heat loss per square foot, (4) the heat loss when the oven door was opened, (5) the time rate of cooling, (6) the calibration of the thermostat, and (7) the temperature distribution in the oven for various average temperatures.

The results for the preheating tests, the heat losses, and the time rate of cooling are shown graphically. Thermostat and heat distribution results are shown in tables. Where a ranking involves time or energy the ovens are ranked in ascending order of the time and energy required. The results are mainly of a comparative character between the different commercial ovens, and no basic conclusions are presented.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1933, H. A. Wallace (*U.S. Dept. Agr., Sec. Agr. Rpt., 1933, pp. III+107, figs. 2*).—In addition to findings noted elsewhere in this issue, data are reported on the storage and transportation of fruits and vegetables (pp. 71, 72), control of stain in pine and hardwood lumber (p. 72), grazing studies (pp. 74, 75), inheritance of egg production (p. 75), use and limitations of roughages in dairying (pp. 75, 76), production of lactose and casein (p. 77), investigations of diets at various price levels (pp. 90-92), recently reported work of the agricultural experiment stations (pp. 94-96), and other projects, including a financial statement.

The Forty-sixth Annual Report of the Colorado Agricultural Experiment Station, [1933], E. P. Sandsten (*Colorado Sta. Rpt. 1933, pp. 24*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

A year's progress in solving farm problems of Illinois: [Forty-sixth Annual Report of Illinois Station, 1933], compiled and edited by F. J. Keilholz (*Illinois Sta. Rpt. 1933, pp. 295, figs. 42*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Iowa College and Station.—*Science* notes that $5,000 has been granted by the Carnegie Corporation to aid in the development of art appreciation among engineering and agricultural students. It is expected that this sum will be used to obtain reproductions of works of art, lantern slides, colored prints, a projection lantern, and other equipment, and that a series of lectures will be included in the engineering and agricultural curricula of the college during the next academic year.

A committee has been set up for a study and recommendations concerning an adequate land use policy for Iowa. For some years, the station has been working on the agricultural rehabilitation of sand lands in southeastern Iowa, and has made considerable progress in developing or finding horticultural varieties suitable to this region. One of the questions now to be carefully considered is whether such land may be more profitably used for agricultural purposes or whether it would be better employed as game preserves. It is hoped that the station will be able to answer such questions, and that from the sand land study the technics for other areas in the State can be developed.

The station has begun the collection of maps of Iowa and its subdivisions (even down to sections) and of mounting, filing, and indexing forms as available. Topographic and soil maps and maps showing landholdings, native cover, timber, quarries, drainage, taxation districts and school districts, land use, yields, etc., will be included. The maps will be filed centrally and made easily accessible.

William F. Watkins, extension assistant professor of farm crops and soils, has been granted a year's leave of absence to serve as agronomist for a Department of the Interior soil erosion project in northern Missouri.

Michigan College.—Over $75,000 has been made available from C.W.A. funds for improvements to the college property, of which $23,000 is for the improvement of the college wood lots.

Mississippi Station.—C. B. Anders, specialist in soils, has been granted leave of absence for six months to take charge of the Federal Soil Erosion Station in Mississippi. Clarence Dorman has been appointed to take care of his work in soils and fertilizers during his absence.

Missouri University and Station.—Enrollment in the College of Agriculture for the second semester showed a slight increase over that for the first semester and a gain of 38 percent over the enrollment for the second semester in 1933.

The difficulties that are met by Missouri farmers in growing clover on the various soil types of the State are being put to a practical and far-reaching test this spring by the station, with the cooperation of 45 farmers whose lands represent at least 11 of the more common types of soil. These cooperative trials should aid in growing the legumes that will best serve as erosion-preventing and soil-improving crops in accordance with the requirements of the Federal Agricultural Adjustment Administration. These problems have been under study for a number of years at the station, with emphasis on the importance of lime. More recently, however, the experiments have indicated that more than lime may be necessary on many soil types. In order to test the possible need of Missouri soils for phosphate and potash in the establishment of clover, the newer trials undertaken a year ago with the aid of a few farmers are now being widely extended. Farmers thus cooperating with the station are seeding clovers with 300 to 400 lb. of finely ground limestone per acre, while on adjoining tracts this application is supplemented by phosphate or potash or both. Trials are now in progress on the Cherokee, Gerald, Summit, Putnam, Lindley, Oswego, Union, Crawford, Wabash, Grundy, and Marshall soil types.

A new project has recently been undertaken on fowl paralysis or neuritis of fowls. Fowl paralysis is a comparatively recently recognized disease, but has become of great economic importance in Missouri in the last few years, causing losses of from 5 to 50 percent of the flocks. The investigation of this disease will be divided into four major divisions of epidemiology, pathology, transmission, and treatment.

Nevada Station.—A number of C.W.A. projects have been completed on the station farm, including the replacing of approximately 5,650 ft. of fencing; the construction of a barn, 30 by 60 ft., of heavy galvanized sheeting; the graveling and grading of roads; leveling approximately 22 acres of farm land; electrifying all barns, sheds, and experimental corrals; replacing by concrete all irrigation boxes and weirs; the construction of a new drain ditch and several irrigation laterals; and a general renovating of corrals and fields.

Rutgers University and New Jersey Stations.—C.W.A. projects have included the building of a trunk sewer; clearing, draining, and landscaping about 100 acres of land; and the repairing of the major buildings of the College of Agriculture and the stations. In addition, about 170 people have been employed in special studies bearing directly or indirectly upon emergency problems in agriculture.

Dr. C. Zinzadzé, formerly connected with the Rothamsted Experimental Station, has been given an appointment in the station laboratories as a postdoctorate fellow. Dr. Walter Fuchs, an authority on lignin chemistry and formerly of the University of Aachen and the Kaiser Wilhelm Institute of Coal Investigations of Mülheim, is to spend a year or two at this institution on studies of problems having to do with the origin and chemistry of humus.

Cornell University and Station.—Dr. L. A. Maynard, professor of animal husbandry and animal nutritionist, has accepted an invitation from the University of Nanking to assist for six months in the development of a program of research and education for the improvement of the nutrition of the Chinese farm family.

Gilbert W. Peck, extension professor of pomology since 1920, died February 8 at the age of 51 years. A native of New Brunswick, he was graduated from the College of Agriculture in 1912 and received the M.S.A. degree in 1917. For the three years following he was county agent of Ontario County.

New York State Station.—Studies of Neufchatel type cream cheese manufacture have been resumed in response to demands for further information on problems which have arisen following the general adoption by the dairy industry of methods devised by the station five years ago. Special attention is to be given in these studies to improving and adapting processing methods. Closely associated with the project are other studies under way with cheese blends. The object of these studies is to devise a method for packaging natural cheese and to process and package cheese without the addition of salts. These studies are part of a program to develop new outlets for dairy products by stimulating demand with greatly improved commodities.

Two new red raspberries, Lloyd George of English origin and Newburg originated on the station grounds, and a new black variety, Naples, also originated there, have shown marked resistance to virus diseases and are deemed likely to become promising factors in a revival of interest in raspberry growing in the State.

Oklahoma College and Station.—The station has completed a new greenhouse built with C.W.A. cooperation at a cost of about $18,000. This house consists of four sections, each 33 by 100 ft. and connected by a glass corridor, giving a total of approximately 14,000 sq. ft. of space. With the cooperation of the C.W.A. and a C.C.C. Camp which is located on station land, a graveled road approximately 2 miles in length has been built connecting all the college barns.

Dr. Lippert S. Ellis, associate professor of agricultural economics and in charge of investigations on agricultural prices, has been given leave of absence for seven months to assist the Federal Farm Credit Administration in its production credit bank department. Leave of absence for one year has been granted to Dr. N. E. Winters, head of the department of agronomy and assistant director of the station, to become regional director for the Federal Soil Erosion Service in Oklahoma, and to H. M. Wallace, assistant professor of agricultural engineering, to assist in this work. W. C. Boatright, assistant in the soil survey, and Guy Kincannon, assistant agronomist in soil conservation, have resigned to accept positions with the Soil Erosion Service in North Carolina.

Oregon Station.—Carl F. Whitaker, assistant chemist from 1927 to 1931, was killed in an automobile accident near Corvallis on January 29. He was a native of Massachusetts and a graduate of the Massachusetts College in 1922.

Pennsylvania College.—Drs. E. R. Martel and J. L. Deen have been appointed instructors in forestry.

Utah College and Station.—An earthquake on March 12 split the walls of the 3-story home economics building. No injury to personnel was reported, but the abandonment of the structure was believed necessary.

Reductions in State appropriations for substations made necessary the closing at the end of the 1933 cropping season of the substations in San Juan, Carbon, Sanpete, and Millard Counties. Final reports were prepared by the superintendents of these substations during the winter months. George Whornham and James H. Eagar, superintendents in Millard and San Juan Counties, have been given temporary appointments in extension work in their respective counties.

Vermont Station.—George F. Anderson, assistant chemist since 1913, died February 5, aged 58 years.

Virginia Truck Station.—A survey is being made by the soils department of the salt content of areas in eastern Virginia which were flooded by sea water in August 1933. Over 6,000 acres were flooded in the counties of Northampton and Accomac on the Eastern Shore and an additional acreage in the Western Shore area. The salt content at 0–6, 6–12, and 12–18 inch levels is being determined for all flooded fields, and recommendations will be sent to the growers regarding the treatment and planting of this area. Individual fields on all the farms affected are being sampled. Studies are also being conducted in the greenhouse regarding the tolerance of potatoes to various concentrations of salt.

A new line of work which will undoubtedly be of direct economic value to the grower is a study of the interrelation between soil reaction, organic content, and growth of various vegetable crops. The results obtained thus far indicate that the quality and quantity of the soil colloids and the amount of organic matter should be taken into consideration in making recommendations regarding liming for the various vegetable crops. Growers are showing an increasing interest in having soils tested for reaction and organic matter, as many as 500 samples per month being received. A number of growers who have cooperated with the station in this work during the past few years have become convinced that correcting the soil to the proper reaction for different crops is one of the most important phases of their production program.

Washington Station.—An allotment of C.W.A. funds made it possible for the station to employ in connection with its regular projects 19 scientific assistants and 10 clerical workers in the laboratory and field during the winter. A project on land classification was also undertaken in eight counties with C.W.A. funds. In addition, a cooperative project with the U.S.D.A. Bureau of Agricultural Economics on tax delinquencies, farm land values, and mortgage foreclosures was organized in every county, and a subsistence homestead project in cooperation with the U.S. Department of the Interior in 16 counties.

Wisconsin University and Station.—Under the will of the late Minnie P. Huber, widow of the former Lt. Gov. Henry A. Huber, a loan fund estimated at $35,000 has been established in the College of Agriculture for students from Dane County interested in the study of agriculture and farm management.

A fellowship in home economics has been established following a gift of $7,250 for the purpose by Dr. H. Steenbock, professor of agricultural chemistry and agricultural chemist, and his sister, Mrs. Robert Bruce Brinsmade. The fellowship will be named in honor of their mother, Christine Margaretta Steenbock, and will be awarded annually.

Dr. Edward H. Farrington, emeritus professor of dairy husbandry since 1927 and widely known for his contributions to the technic of dairy chemistry, died March 22 at the age of 73 years. Dr. Farrington was born in Maine, graduated from the Maine State College in 1881, and received there the M.S. degree in 1883. He was chemist of the Connecticut [New Haven] Station from 1882 to 1888 and the Illinois Station from 1890 to 1894, as well as assistant in the U.S.D.A. Office of Experiment Stations from 1888 to 1889. His service in Wisconsin began in 1894 and continued without interruption for 43 years. He originated the alkaline tablet test for acidity in milk and cream, the high-pressure oven for estimating water in butter, the Wisconsin milk sediment test, and the Farrington test for fat and butter. He was also the author of Testing Milk and Its Products (with Woll), first issued in 1897, A Guide to Quality in Dairy Products (1927), and other publications.

New Journals.—*Revue Universelle d'Agriculture* is being published at Budapest, Hungary, as a monthly review of agricultural associations, international agricultural policy, and related matters. Short articles are to be published in German, English, or French, and will give special attention to national or international agrarian trends and the activities of the leading international and scientific agricultural institutions. Among those appearing in the initial number is one entitled Proposals for the International Organization of Corn Marketing.

Zeitschrift für Weltforstwirtschaft is a monthly review of world forestry, published by J. Neumann, Neudamm, Germany. The initial number contains numerous abstracts classified by countries, brief reports as to forestry conditions in various countries and other data, and the following original articles: Foreword, by F. Heske (pp. 1–7); Italian Forest Policy, by A. Hofmann (pp. 8–16); and Forestry in Latvia (pp. 17–43) and Forestry in Estonia (pp. 44–50), both by F. Lühr.

D N C Revista do Departamento Nacional do Café is being published monthly by the National Coffee Department, Rio de Janeiro. The initial number deals mainly with the economic phases of the coffee trade, including the fiscal regulations for the roasting, grinding, and sale of coffee. It also contains an article entitled Agronomic Problems of Coffee, by R. de Camargo (pp. 6–8).

Friesia is being published at Köbenhavn (Copenhagen), Denmark, as a continuation of *Meddelelser fra Foreningen til Svampekundskabens Fremme*, and is devoted to the study of Scandinavian macromycetes. The initial number contains, among others, an article entitled Mycological Impressions from Studies in North America, by J. E. Lange (pp. 21–27).

Arquivos do Instituto de Biologia Vegetal is being published from time to time by the Institute of Vegetable Biology of the Ministry of Agriculture at Rio de Janeiro, Brazil. The initial number contains among others the following articles: Boron in Plant Nutrition, by A. Barcellos Fagundes (pp. 3–26), and Anomalies Observed in *Zea mays* L., by F. R. da Silveira (pp. 41–47).

The Farm Economist is being published quarterly by the Agricultural Economics Research Institute, Oxford, England, replacing the quarterly publication *Occasional Notes*. Its scope has been broadened to include articles by workers at other institutions.

Miscellaneous.—Florence E. Ward, prominently identified with the development of extension work by the U.S. Department of Agriculture, died February 23. A native of Wisconsin and a graduate of the National Kindergarten and Elementary College of Chicago in 1903, she was in charge of the kindergarten training department of the Iowa State Teachers College from 1906 to 1914 and professor of vocational education in the Washington College from 1914 to 1915. In the latter year she was given charge of the Department's extension work with farm women, and since 1923 had been in charge of all cooperative extension work in the Eastern States. She was the author of Montessori Method and the American School, published in 1912.

The retirement is noted of H. A. Ballou as Commissioner of Agriculture for the British West Indies and head of the department of zoology and entomology in the Imperial College of Tropical Agriculture. A native of New Hampshire and a graduate of the Massachusetts College in 1895, he had been associated with entomological work in the British Empire, largely at Barbados, since 1903. In 1916–17 he served as adviser to the Egyptian Government on the control of the pink bollworm of cotton, for which service the grade of Commander of the Order of the Nile was conferred upon him by the Sultan. In 1933 King George V bestowed upon him the Order of the Commander of the British Empire.

An appeal has been received from Stazione Sperimentale per la Lotta Antimalarica, Corso Vittorio Emanuele 168, Roma, 116, for publications pertaining to malaria. A malaria library was founded by this station in 1925, which issues annually an index to malarial literature and is prepared to supply at cost photostat copies of any articles on file.

The Sixteenth International Congress of Agriculture will be held at Budapest, Hungary, from June 14 to 20, 1934. The subjects for discussion will include agricultural education, cooperation, livestock production, the organization of the dairy industry, rural crafts and industries, rural economy, rural housing, viticulture, and the place of women in agriculture.

The date of the Sixth International Botanical Congress, which is to meet in Amsterdam, has been changed to September 2–7, 1935.

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EDITORIAL

PROGRESS IN AGRICULTURAL ADJUSTMENT

Under the title of Agricultural Adjustment: A Report of Administration of the Agricultural Adjustment Act, May 1933 to February 1934, a comprehensive volume of approximately 400 pages has recently been issued by the Federal Department of Agriculture. This is the first extensive report of the stupendous and unprecedented activities initiated less than a year ago in the effort "to adapt American agriculture to changed conditions." It supplements the outline of general policies contained in the annual report of the Secretary of Agriculture with "a complete and detailed description of what has been done toward effectuation of these policies and the purposes of the Agricultural Adjustment Act."

The report opens logically with a discussion of the objectives and mechanisms. It cites as the underlying incentive of the legislation the severe disparity prevailing between prices of farm products and other products, the immediate cause of which is ascribed to the pressure of surpluses on the market, and it discusses the steps taken under the legislation to "relieve the existing national economic emergency by increasing agricultural purchasing power."

The act was approved May 12, 1933. It is pointed out in the foreword that despite the short time it has been in operation, "a partial measure of economic recovery has been brought to American agriculture. Total farm income from crops in 1933, including rental and benefit payments, is estimated to have been $3,271,000,000, as compared with $2,113,000,000 in 1932, an increase of nearly 55 percent. Part of this recovery was undoubtedly due to the adjustment program, just getting under way . . ."

The major program is discussed in detail in chapters devoted to the various commodities, including cotton, wheat, tobacco, corn and hogs, dairy products, rice, sugar, beef cattle and sheep, and special crops. Chapters are also given on surplus relief operations, miscellaneous codes and marketing agreements, the functioning of consumers' counsel, court decisions on the constitutionality of the act, the incidence of processing taxes, and the effects of the program on farm buying power, as well as extensive financial statements and other data.

An idea of the vastness of the undertaking is revealed in a summary of salient facts relating to cotton. From this it appears that 1,026,514 cotton growers carried out adjustment contracts with the

Government in 1933, embodying 73 percent of the total acreage and removing from production 4,400,000 bales of cotton. The cash rentals on the land thus taken out of production amounted to $112,000,000, and the increase in farm values of the cotton crop (seed and lint) for 1933 over 1932 reached a total of $431,760,0000, or 101.5 percent.

One of the major problems confronting the Administration was the organization on short notice of an adequate personnel. By February 1934 the total number of employees was estimated at about 3,700, of whom approximately 2,700 were engaged in examining and checking records of contracts from farmers, auditing and approving contracts for payment, and writing and mailing checks to farmers, while the personnel of commodity and service sections numbered about 1,000. As the report points out, "the Administration, as provided in the act, was established as a part of the Department of Agriculture, and its activities were closely coordinated with those of the rest of the Department. It has drawn upon the experience, the technical knowledge, the accumulated statistical data, and the informational, organizing, and educational facilities of the other units of the Department. Much of the work of the Administration has been done by personnel transferred from the other units. In some cases the other units have cooperated by taking charge of work delegated to them."

Special acknowledgment is made in this connection of the services rendered by the Extension Service. This Service, it is stated, "with its county agents in all parts of the country has been invaluable. For a time danger existed that the Extension Service might be destroyed or crippled when State after State confronted the necessity for economy in its expenditures; but when the big programs were prepared by the Adjustment Administration, it was immediately seen that a far-flung field service to work with the decentralized county associations of producers was essential to securing the necessary farmer cooperation and support and could be most useful and effective. The Extension Service took up the task and instead of decreased usefulness it has been of increasing effectiveness, making possible already the success of the cotton, wheat, and tobacco programs. The 2,200 county agents constituted the 'shock troops' out on the firing line in these campaigns. It was through them that the Administration made its direct contacts with the farmers, getting the work of setting up county production control associations under way. . . . The success attained is evidence of effort put forth by the county agents and their spirit and ability. It is expected that the Extension Service will become more and more important in the long-time program being worked out by the Agricultural Adjustment Administration."

A closing chapter of the report which has much of special interest for readers of the *Record* deals with planning for the future. It is stated that completion of the programs for the retirement from production of corn, wheat, cotton, and tobacco, under the terms of the allotment control contracts now authorized, will probably withdraw from commercial production more than 40,000,000 acres of land, and that this removal "raises puzzling questions as to regional and commodity competition, rotations, replacement crops, use of labor, and the like." For this reason, "it is not enough for the Administration merely to contract with farmers to reduce the production of cotton, wheat, corn and hogs, or tobacco. It also must assist farmers in answering the questions which immediately confront them when they cut down these crops."

With a view to coping with this situation, correlating the program for all commodities and shaping the entire program into "a coherent whole which will constitute an advance through emergency measures to an established and lasting agricultural industry to the ultimate benefit of the whole Nation," a Program Planning Division has been set up, in charge of Assistant Administrator H. R. Tolley of the California University and Station. The objective, it is announced, "will be to develop a regionalized plan which will result in the desired production for the country as a whole, and which, at the same time, will permit each individual farmer to follow the system of farming best adapted to his conditions and farm."

The report emphasizes the fact that "planning such an agriculture and providing constant guidance will call upon all available skill and training, experience, and knowledge. Colleges of agriculture, extension services, experiment stations, farm leaders, farm organizations, and county production control associations will be needed to develop the necessary regional and national program."

Inclusion of the experiment stations in the agencies mentioned draws attention anew to the important fact-finding service already rendered by these institutions and to the opportunities and responsibilities which may lie before them. A similar conception has recently been expressed in the introduction to the 1933 report of the South Carolina Station in the following language: "Agricultural research is the foundation for agricultural recovery. It is only by means of research—carefully planned and thoroughly executed investigation—that reliable bases for progress can be established. Each new peg of progress in a program of planned agriculture must be driven deep into a scientific understanding of the forces underlying agricultural well-being or else the program will fail even before it is well under way." The potential value of the experiment stations in this connection seems manifest.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Organic and bio-chemistry, R. H. A. Plimmer (*London and New York: Longmans, Green & Co., 1933, 5. ed., pp. X+624, pl. 1, figs. 69*).—The preface to this revision of the volume previously entitled Practical Organic and Bio-Chemistry (E.S.R., 56, p. 309) states that "with further amplifications the book has become a fuller course on the subjects, both theoretical and practical. Consequently, the title has been altered. Some of the matter contained in earlier editions, but omitted in the last edition, has again been included at the desire of many of the readers. Numerous sections have been entirely rewritten."

[Chemical and bacteriological investigations of the New York State Station] (*New York State Sta. Rpt. 1933, pp. 17–19, 44, 45*).—Data are included on sauerkraut investigations, including work on control of the fermentation, the quality of commercial sauerkraut, and rate of fermentation; spoilage of tomato pulp and ketchup; on the clarification of fruit juices; on fruit-juice pasteurization; on fruit juices (preparation of improved concentrates, preservation of color and flavor); and on the preparation of a crystalline orange seed globulin and the electrophoretic measurement of its isoelectric point.

The antimony trichloride reaction with compounds containing five-membered monoheterocyclic rings, V. E. Levine and E. Richman (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 373–390*).—This paper summarizes and discusses the results obtained in the antimony trichloride reaction, with and without the addition of acetic anhydride as a catalyzer, as applied to compounds containing five-membered monoheterocyclic rings, including pyrrole, thiophene, and furfuran and some of their complex derivatives, and also various vegetable oils.

The fact that color reactions were obtained with most of the compounds tested led the authors to conclude that the color reaction obtained with antimony trichloride in chloroform solution is not specific for vitamin A, although it may prove to be indicative of the presence of a specific grouping or configuration in the vitamin A molecule. It is thought that compounds other than vitamin A possessing chromogenic properties with reference to antimony trichloride are common components of both animal oils rich in vitamin A and vegetable oils devoid of vitamin A. In contrast with the instability toward oxygen of vitamin A, the chromogenic compound not possessing vitamin A potency gave a more intense antimony trichloride reaction following treatment with oxidizing agents.

A list of 72 references to the literature is appended.

The formula of the B_1-vitamin, B. C. P. Jansen, J. P. Wibaut, P. J. Hubers, and P. W. Wiardi (*Rec. Trav. Chim. Pays-Bas, 52 (1933), No. 4, pp. 366–370*).—The authors, with the technical assistance of J. Brienne, have prepared crystalline concentrates of vitamin B_1 from rice polishings and dried brewery yeast, and subjected them to elementary analysis by the methods of Pregl, with the following results for the concentrates from rice polishings and yeast, respectively: C 40.83 and 41.06 percent, H 5.61 and 5.77, N 14.67 and 15.44, S 9.22 and 9.12, and Cl 20.31 and 0 percent. These data and previously reported analyses by Windaus et al. (E.S.R., 67, p. 101), Ohdake (E.S.R., 69, p. 6), and Van Veen (E.S.R., 69, p. 326) are thought to agree most closely with the formula $C_{12}H_{18}O_2N_4S.2HCl$ for the crystalline hydrochloride.

The close agreement of the analyses from four different laboratories would be thought to indicate that these preparations are pure vitamin B_1 were it not for the reported isolation by Kinnersley, O'Brien, and Peters (E.S.R., 69, p. 326) of a crystalline substance with an activity 1.75 times that of the Windaus preparation. "Should the formula of their more active preparation be quite different from the above, then it becomes probable that the agreement between Windaus, Ohdake, Van Veen, and ourselves is only fortuitous. Speaking generally, we would say that the formula of a substance such as vitamin B_1 is only undoubtedly established when it is prepared synthetically."

See also a later report by Kinnersley et al. (E.S.R., 70, p. 153), in which it is stated that their crystals do vary slightly in chemical composition from those of the investigators noted above.

Vitamin B_4 and adenine, R. D. Heard, H. W. Kinnersley, J. R. O'Brien, R. A. Peters, and V. Reader (*Nature [London], 131 (1933), No. 3313, pp. 617, 618*).—In reply to a suggestion of Tschesche of the similarity between adenine hydrochloride and the crystals highly active as a source of vitamin B_4 isolated by Barnes, O'Brien, and Reader (E.S.R., 69, p. 902), it is noted that a specimen of adenine hydrochloride has been tested by Reader for vitamin B_4 with negative results and that some crystalline preparations of vitamin B_1 in which no adenine could be detected were still contaminated with highly active vitamin B_4. Further unpublished investigations of Heard and O'Brien have shown, however, that crystals of high vitamin B_4 activity are largely adenine, thus indicating that the vitamin B_4 must be active for rats in doses of less than 1γ per day.

Crystal structure of vitamin B_1 and of adenine hydrochloride, J. D. Bernal and D. Crowfoot (*Nature [London], 131 (1933), No. 3321, pp. 911, 912*).—Crystals of vitamin B_1 (hydrochloride) from various sources have been found to be substantially identical in form and X-ray patterns but to show slight differences in optical properties, suggesting the possibility that variable amounts of impurity may be present in solid solution. The close resemblance between crystals of vitamin B_4 and adenine hydrochloride, as noted above, was confirmed. The two crystals were identical in external form and optical properties and differed only in that the crystals of vitamin B_4 appeared slightly inhomogeneous. These findings are thought to suggest that "the substance showing B_4 activity can only exist as an impurity in the crystals prepared by Peters. There are three possibilities: (1) The impurity is in the form of an amorphous material adsorbed on the crystals, or if it is in solid solution it must either (2) be present in extremely minute quantities, or (3) itself be a substance closely allied to adenine hydrochloride."

Specificity of hexuronic (ascorbic) acid as antiscorbutic factor, L. J. Harris and S. N. Ray (*Biochem. Jour., 27 (1933), No. 2, pp. 580–589, figs. 4*).—This paper summarizes briefly in chronological order the evidence contributed by various investigators to the hypothesis that the hexuronic acid of Szent-Györgyi is identical with vitamin C, including a preliminary report from the authors' laboratory definitely supporting the theory (E.S.R., 69, p. 169), and presents the detailed results of their studies, together with further supporting evidence.

A micro-chemical method for determining the hexuronic acid (vitamin C) content of foodstuffs, etc., T. W. Birch, L. J. Harris, and S. N. Ray

(*Biochem. Jour., 27 (1933), No. 2, pp. 590–594*).—Essentially noted from a preliminary report (E.S.R., 69, p. 169).

The liberation of invertin from yeast, II [trans. title], W. Grassmann and T. Peters (*Hoppe-Seyler's Ztschr. Physiol. Chem., 204 (1932), No. 3–4, pp. 135–148*).—Invertin may be set free from yeast through the action of amylase of vegetable origin and by proteinases of the papain group. The methods used for the preparation of the enzymes and for the liberation of invertin, as well as experimental results, are given.—(*Courtesy Biol. Abs.*)

Handbook of the analysis of plant substances.—IV, Special analyses—pt. 3, sect. 1, Organic substances; sect. 2, Organic substances, special methods, and tables, edited by G. Klein (*Handbuch der Pflanzenanalyse. Band IV, Spezielle Analyse. Teil III, 1. Hälfte, Organische Stoffe; 2. Hälfte, Organische Stoffe, Besondere Methoden, Tabellen. Wien (Vienna): Julius Springer, 1933, vol. 4, pt. 3, sect. 1, pp. XII+838, figs. 39; sect. 2, pp. VI+839–1868, figs. 82*).—Section 1 continues the general topic of organic substances (E.S.R., 68, p. 729). Section 2 contains a further continuation of the subject of organic substances, a section on special methods, and a section devoted to tabular information.

Detection and estimation of formaldehyde within the cell of a green plant by the Allison apparatus, A. L. Sommer, E. R. Bishop, and I. G. Otto (*Plant Physiol., 8 (1933), No. 4, pp. 564–567, fig. 1*).—In studies at the Alabama Experiment Station, formaldehyde was detected in cells of an alga (probably *chlorella* sp.). It increased within the cell on exposure to light, attaining a maximum within about 20 min. and remaining constant thereafter.—(*Courtesy Biol. Abs.*)

A critical examination of analytical methods used in the determination of exchangeable potassium and sodium of soils, M. L. M. Salgado (*Soil Sci., 37 (1934), No. 1, pp. 39–48*).—Analytical methods used in the determinations of exchangeable potassium and sodium of soils are critically reviewed, and the unsatisfactory nature of the methods mentioned in the literature is emphasized. As sodium and potassium occur in the absorption complex in amounts minute as compared to those of the alkaline earth bases, "accurate and standardized methods are necessary in view of the important role exchangeable sodium and potassium play in soils."

Ammonium acetate as a replacing salt for the determination of exchangeable potassium gave very reliable results, "in contrast to the errors associated with the use of ammonium chloride as observed by Milne [E.S.R., 64, p. 310]." A simple and rapid technic is described. Essentially, the potassium was determined by means of a slightly modified form of Milne's cobaltinitrite-volumetric method, the sodium by precipitation with Kolthoff's zinc-uranyl acetate reagent (E.S.R., 58, p. 608).

An examination of the Degtjareff method for determining soil organic matter, and a proposed modification of the chromic acid titration method, A. Walkley and I. A. Black (*Soil Sci., 37 (1934), No. 1, pp. 29–38, fig. 1*).—In this contribution from the Rothamsted Experimental Station, the chromic acid-hydrogen peroxide method of Degtjareff (E.S.R., 63, p. 505) for the rapid determination of soil carbon "is shown to give entirely fictitious results."

"The hydrogen peroxide not only serves no useful purpose but introduces a fundamental error, since its reaction with chromic acid follows a different course in the determination with soil from that in the corresponding blank. Two molecules of CrO_3 react with four molecules of H_2O_2 in the absence of soil but with three in the presence of soil or ignited soil. The gain in apparent carbon through this error approximately balances the incompleteness of oxidation for the conditions under which Degtjareff appears to have worked."

A new approximate method giving about 76 percent recovery of carbon is proposed. Finely divided soil is treated with standard potassium dichromate and twice the volume of sulfuric acid added to raise the temperature; after being stirred for a minute the mixture is diluted and the excess dichromate titrated. This procedure is more rapid than others so far proposed, and " it is belived that it may prove useful for comparative purposes where no very exact determination is required."

Large-scale experiments in sulfuring apricots.—II, Effect of dehydrating, shade-drying, and blanching, E. M. Chace, C. G. Church, and D. G. Sorber (*Indus. and Engin. Chem., 25 (1933), No. 12, pp. 1366–1370, figs. 2*).—Continuing earlier work (E.S.R., 65, p. 509), when apricots were blanched by steam before drying, the quality of the dried fruit was not improved, and the retention of sulfur compounds was not reduced. Dehydration did not produce dried fruit of better quality or with a lower content of sulfur dioxide than sun-drying. Exposing apricots to the sun for 40 hr. before dehydrating resulted in products having a color more acceptable to the trade than where all the drying took place in a dehydrator. No advantage was found by drying under shade. Drying for part of the time in the sun and finishing the drying under shade is a satisfactory method for the inland valleys, but not for localities where the sky is overcast during an appreciable part of the day. The extent of the penetration of the sulfur dioxide into the fruit at the time it is removed from the sulfuring rooms is not a satisfactory guide for estimating the amount of sulfur compounds which will be retained by the finished product or its grade.—(*Courtesy Biol. Abs.*)

AGRICULTURAL METEOROLOGY

The drama of weather, N. Shaw (*Cambridge, Eng.: Univ. Press, 1933, pp. XIV+269, pl. 1, figs. 92; rev. in Nature [London], 133 (1934), No. 3351, pp. 83, 84*).—This book "of unconventional essays", dedicated "to watchers of the world's weather near and far", attempts to present the sequence of meteorological events as a pageant. It consists of a prologue; five chapters dealing with ideas of the drama, ancient and modern, the watchers (what they see and what they say), the score, the chorus (rhythmic aspects of the records), and the weather map, which presents the play; and an epilogue devoted to the weather map of the future.

In his preface the author says, among other things, "Recent activity in the study of the influence of weather on crops leads to the consideration of meteorological accumulations in relation to natural integration. . . . In deciding questions of growth and survival Nature never forgets the past, and therein we deal with integrals that the mathematician cannot emulate. That part of meteorology we call phenology, . . . and for its use we must invoke gradual accumulations that do not appear on any weather map."

In a brief historical review of agricultural meteorology, the author remarks on the apparent indifference alike of the rank and file of agricultural students and of meteorologists to efforts to trace the response of crop growth to environmental conditions, and on the small progress that has been made in this direction. He suggests the advantage of extending the phenological method and seasonal sequence more generally to cultivated crops.

Seasonal weather and its prediction, G. T. Walker (*Brit. Assoc. Adv. Sci. Rpt., 103 (1933), pp. 25–44, figs. 14; abs. in Nature [London], 132 (1933), No. 3343, pp. 805–808, figs. 4; Sci. Abs., Sect. A—Phys., 37 (1934), No. 434, p. 131*).—This article discusses briefly the reliability and value of various proposed bases and methods of seasonal forecasting, particularly the degree of success that has followed the use of atmospheric oscillation, behavior of monsoons, ocean temperatures, and the like, for this purpose. Reference is also made to the relation of solar activity to weather changes. It is stated that while certain striking correlations have been observed which seem to have value for forecasting purposes, differences between actual and forecast figures are still considerable, and "predictions can only be issued with restraint if public confidence is to be won." The desire and need for seasonal forecasts is referred to, and the importance of further study with this object in view is emphasized.

Is our climate changing? A study of long-time temperature trends, J. B. Kincer (*U.S. Mo. Weather Rev., 61 (1933), No. 9, pp. 251–259, figs. 12*).—From a study of temperature and related data, running back in one case (New Haven) as far as 1780, the author concludes that "temperature trends in middle latitudes of the Northern Hemisphere, and also, though less pronounced, in the Southern Hemisphere, have been prevailingly high for a long time." For example, he shows that of the last 21 winters, 1912–13 to 1932–33, inclusive, in Washington, 18 have been warmer than normal. Every one of the last 10 winters in New Haven have averaged warmer than normal, as have 33 of the last 45 winters. "In St. Paul, Minn., more than 75 percent of the fall seasons for the last 43 years previous to 1933 have been relatively warm, in contrast to the 37-year period from 1840 to 1876, inclusive, during which only 9 were warmer than normal. In Washington, D.C., only 3 of the 25 falls since 1907 have had below-normal temperatures, while 15 of the last 17 months, up to and including September 1933, have had plus departures from normal."

Protection of forests and agricultural crops against wind (*Protection des forêts et des cultures agricoles contre le vent. Roma: Inst. Internatl. Agr., 1933, pp. 264*).—This report summarizes replies, from some 20 countries of the world, to a questionnaire. Different chapters give information for each country regarding geographic characteristics; meteorological observations with special reference to winds; damage caused by winds; period of growth during which greatest damage is caused; protective plants used; plants best adapted to windbreaks and how used; protection of lands near sand dunes; protection of lands recently reforested or deforested; arrangement of timber cuttings; treatment of forests damaged by wind; treatment of damaged hedges; protection of herbaceous plants by other herbaceous plants and ornamentals; protection of tropical plants; extent of protected areas; unfavorable effect of protective measures on cultivated crops; cultivated plants resistant to shading by windbreaks; role of birds in the zone protected by windbreaks; artificial windbreaks; windbreaks as protection of human habitations and animal shelter; comparison of protected and unprotected crops; economic advantages of windbreaks aside from their protective value; cooperation of land-owners in protection against wind; cost of establishment and maintenance of windbreaks; and laws and regulations regarding windbreaks and hedges.

A considerable bibliography classified by countries is appended.

Upper-air wind roses and resultant winds for the eastern section of the United States, L. A. Stevens (*U.S. Mo. Weather Rev. Sup. 35 (1933), pp. [1]+68, figs. 65*).—This is a summary of results of pilot-balloon observations at 14 Weather Bureau stations in the eastern United States, computed on the basis of heights above sea level.

Climatological data for the United States by sections, [September–October 1933] (*U.S. Dept. Agr., Weather Bur. Climat. Data, 20 (1933), Nos. 9, pp. [202], pls. 3, figs. 4; 10, pp. [200], pls. 3, figs. 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Monthly Weather Review, [September–October 1933] (*U.S. Mo. Weather Rev., 61 (1933), Nos. 9, pp. 251–292, pls. 10, figs. 28; 10, pp. 293–319, pls. 10*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 9.—Is Our Climate Changing? A Study of Long-time Temperature Trends, by J. B. Kincer (pp. 251–259) (see p. 744); Baltimore, Md., Weather Records for Over 100 Years, by J. R. Weeks (p. 260); The North Atlantic Trade Winds, by C. L. Ray (pp. 261–264); The Temperature Relations between Water and Air at Saint Andrews, N.B., by H. B. Hachey (pp. 264–266); A Remarkable Occurrence of Cyclones in Series, by E. H. Bowie (pp. 266, 267); Fog Formation and Dissipation in the Oklahoma City Area, 1920 to 1931, Inclusive, by P. O. Epperly (pp 267–269); Rain-bearing Winds of Central Oklahoma, by Epperly (pp. 269–271); Unusual Haze Conditions over the United States and the Caribbean Sea in 1933, by J. W. Smith (p. 272); Low Barometer Readings in West Indian Disturbances of 1932 and 1933, by W. F. McDonald (pp. 273, 274); Tropical Disturbances of September 1933, by C. L. Mitchell (pp. 274–276); and Typhoons in the Far East, September 1933, by C. E. Deppermann (pp. 284, 285).

No. 10.—The Mean Barometric Pressures along the Various Circles of Latitude—A Résumé of Data, by L. P. Harrison (pp. 293–295); Heavy Rainfall in Georgia, by G. W. Mindling (pp. 295–299); Types of Heavy-Rain-producing Storms in Georgia, by A. H. Scott (pp. 299, 300); Remarks on the Theory of the Psychrometer, by W. J. Humphreys (pp. 300–302); The Cold Pole of South America, by J. B. Navarrete, trans. by W. W. Reed (p. 302); An Aid in Locating and Studying Clouds, by I. F. Hand (pp. 302, 303); Supersaturation Again, by Humphreys (pp. 303, 304); and Typhoons in the Far East during October 1933, by Deppermann (p. 313).

Scientific activity of the National Meteorological Office of France in reference to agriculture [trans. title], [E.] Delcambre (*Compt. Rend. Acad. Agr. France, 19 (1933), No. 12, pp. 418–423; abs. in [Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Roma], 24 (1933), No. 11, p. 475*).—This is a brief summary of a report to the Agricultural Academy of France showing the effort which is being made by the National Meteorological Office to keep farmers, as completely and constantly as possible, supplied with needed information regarding weather and climate and their relation to crops, and to show how such information can be used by them to the greatest advantage. It is shown that the office makes special effort to keep itself informed of the farmers' needs through questionnaires and various special agencies which it has set up for the purpose. In addition it has studied such questions as effects on crops of cold weather, droughts, storms, and floods; correlation between seasonal meteorological factors and crop yields; forecasting crop yields; frost protection; and hail.

SOILS—FERTILIZERS

[Soil and fertilizer investigations] (*Arizona Sta. Rpt. 1933, pp. 9–15, fig. 1*).—The station here reports upon its investigations into the composition, formation, and determination of base-exchange compounds in soils, soil conditions which induce malnutrition of plants, and factors which influence water penetration in alkali soils; and upon a microbiological study of Arizona soils, the maintenance of permanent fertility in irrigated soils, and a lysimeter study of the nitrogen balance in irrigated arid soils.

[Soil investigations of the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 74, 75, 76, 78, 79*).—Brief notes are given on physicochemical studies of muck soils, availability of potassium in soils, comparison of artificial manure and animal manure, soil- and crop-management studies, and pot experiments on the fertilizer requirements of pasture soils.

[Soil and fertilizer studies in North Carolina] (*North Carolina Sta. Rpt. 1932, pp. 15, 16*).—The work reported included data on the chemical and physical properties of the Durham series of soils (W. B. Cobb), magnesia deficiencies of sandy soil types (L. G. Willis), and the absorption of iron from highly organic acid soils (Willis).

[Soils report] (*Georgia Coastal Plain Sta. Bul. 21 (1933), pp. 100, 101*).—Comparative tests at the Coast Station at Darien of drainage systems, methods designed to make possible the use of delta soils for truck crops, cover crop tests, and lime requirement studies are noted.

Soil survey of Montgomery County, North Carolina, R. C. Jurney and W. A. Davis (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1930, No. 13, pp. 34, figs. 2, map 1*).—This county is an area of 312,320 acres in south-central North Carolina, its surface relief ranging from that of a few areas so flat as to have poor drainage to that of steep slopes subject to excessive drainage and active erosion.

Georgeville stony silt loam is the most extensive of the 16 series and 27 types of classified soils, constituting 13.7 percent of the county, followed by Georgeville silty clay loam and gravelly silty clay loam with 11.9 and 11.3 percent. Nonagricultural soils include 3.6 percent of rough stony land. A total of 28.5 percent of lands, including the Georgeville stony silt loam, is "classed as forest soils, not because they produce better trees than other soils—in fact they do not—but because the surface relief and stony character of the soils render them unsuitable for general-farming operations."

A study of claypan soils, I. C. Brown, T. D. Rice, and H. G. Byers (*U.S. Dept. Agr., Tech. Bul. 399 (1933), pp. 43*).—Detailed mechanical and chemical analyses of complete profiles of eight soils, together with the analyses of their colloids, are presented. Included with these analyses are determinations of the soluble salts and H-ion concentrations of each horizon and the water-vapor absorption of the colloids over 3.3 and 30 percent sulfuric acid. The analyses are preceded by a description of each profile and of the areas in which the soils occur, together with data on climatic and vegetative conditions. From the analytical data are calculated the ratios of the silica to sesquioxide, iron oxide, alumina, and total bases, and the ferric oxide-alumina ratios. The data are also "made the basis of calculation of what is called the total combined water of the soil acid; that is, the combined water of the soil colloid plus the water equivalent of the bases present."

The data are considered to show that the six chernozem soils contain a colloid which, though developed under a rainfall ranging from 13 to 32 in., is essentially the same material. This varies in calcium carbonate, organic matter, and base content, but has a mean value of the silica-sesquioxide ratio of 3.53. "The analyses of Fargo clay show it to be a pseudopodsol, the gray layer of which may be considered as being produced by chemical action rather than colloidal translocation downward."

A general discussion of the chemical and physical properties of the colloids leads to the conclusion that "the dominant material in the colloid is an acid salt of hypothetical pyrophyllic acid, $H_3AlSi_2O_7$. This salt is considered to have the general formula $MH_3(AlSi_2O_7)_2$, in which the bases are chiefly magnesium, calcium, potassium, and sodium."

The examination of the moisture relations "leads to the apparently unorthodox and improbable conclusion that the water-vapor absorption of the organic colloid of these chernozems, at least, is less than for the corresponding inorganic colloid, although other possible explanations are pointed out." The data also led to the tentative conclusion that chemical relations play an important part in determining the quantity of hygroscopic water which may be absorbed by soil colloids.

[Alkali land reclamation] (*Wyoming Sta. Rpt. 1933, p. 27*).—An experiment showing the holding of an irrigation-water pond on an area of alkali land at the Lyman Experiment Farm for 60 days and treating with 10 tons of manure per acre to have been decidedly more successful from the viewpoint of crop increases than other treatments is recorded.

Moisture and fertility relations of subsoil variations in heavy silt loam soil at Goodwell, Oklahoma, H. H. Finnell (*Oklahoma Sta. Bul. 214 (1933), pp. 11*).—The data presented include hygroscopic moisture figures determined in each foot to a depth of 6 ft., the lowest observed total moisture in the same layers during the period 1924–31, the quantity and distribution of soil moisture in heavy silt loam soils having subsoil depths of 4, 5, and 6 ft., moisture factors for a 4-ft. soil layer approximately coextensive with the root zone, etc.

In a 9-yr. comparison of crop yields and variability, "the shallow phase of soil failed by 1 to 2 bu. per acre in yielding the grain produced under the same system of culture on the deep phase of soil. Although no great differences in dependability were shown as indicated by the coefficient of variability, the advantage was consistently in favor of the deep phase. There was no consistent relation between production and the relative amounts of total nitrogen in the root zone, but the effects of available moisture supply on yield were apparent under every system of culture. Under the present fertility level, which is approximately 90.7 percent of the original in the case of the deep phase of the soil and 88 percent of the original in the case of 5-ft. soils, efficiency of moisture utilization is of greater consequence in determining yields than the fertility resources of the soil."

The settling volume of soils, H. E. Middleton and H. G. Byers (*Soil Sci., 37 (1934), No. 1, pp. 15–27, pl. 1, figs. 5*).—The authors of this contribution from the Bureau of Chemistry and Soils, U.S.D.A., determined a new soil water relation, the "settling volume" of soils and of soil colloids. Their procedure is thus described:

"A quantity of air-dry soil equivalent to 50 g of oven-dry soil is put into a 250-cc beaker, and 35-40 cc of water is added. The soil and water are vigorously stirred, and the beaker is placed in a vacuum desiccator and evacuated until the mixture boils vigorously. The mixture is poured into a 100-cc graduate with the minimum quantity of water required for rinsing the beaker. The resulting volume is usually about 90 cc. The graduate is covered by the palm of one hand and shaken vigorously. It is then set on the table, the inside washed down with a fine water jet, and the volume made up to 100 cc. The suspension is allowed to stand for 24 hr. and the soil volume noted. The graduate is again shaken and allowed to stand 24 hr. The process is repeated until a constant volume is reached; this obtains usually after 3 or 4 shakings. The volume is noted to the nearest 0.5 cc. Duplicates agree within 1 cc, and the difference is seldom so great. The line between soil suspension and water is very sharp. Occasionally there is a suspension of colloid of small magnitude in the supernatant liquid, but when it finally clears the flocculated material seldom changes the volume by more than 1 cc. On long standing, indeed for several weeks, the volume of the suspension does not change materially. In some instances anaerobic fermentation produces a gas evolution which causes a slight increase in volume. Occasionally, also, a slight decrease occurs."

For the measurement of the settling volume of the separated soil colloids the procedure was the same, except that the process was adapted to a sample of 10 g in place of the larger sample taken in the case of whole soils.

The settling volumes of 10 soils obtained at the erosion experiment stations and of widely various characteristics were determined, and were studied in comparison with their known general physical and chemical properties.

"The term 'water saturation capacity' is used to define the percentage water content of the soils at their settling volume, and a comparison is made between this value and the water vapor absorption, moisture equivalent, and total maximum water holding capacity of the soils. It is pointed out that this relation, as far as it is dependent upon colloid composition, is affected not only by the character of the acids and oxides present and by the organic matter, but also by the kind and quantity of bases present."

A new apparatus for measuring soil shrinkage, A. N. Puri, E. McK. Taylor, and A. G. Asghar (*Soil Sci., 37 (1934), No. 1, pp. 59–63, figs. 2*).—The apparatus, which is shown diagrammatically in a figure, consists of a U-tube with limbs of unequal diameter (31 and 13 mm). The narrow limb extends to a 100-cc burette tube attached to it with rubber tubing. It has also a side tube connected to two water reservoirs through pinchcocks, so that the water level in the burette tube can be raised or lowered by opening the upper or lower pinchcock. The U-tube is filled with mercury, and water is admitted through the side tube until the burette is filled to the top division. The wider limb of the U-tube is fitted with a thick brass cap having a hole on one side through which passes a thin steel rod ending in a prong. Attached to the steel rod is a fine pointed needle. The steel rod can be raised or lowered and may be clamped in position by means of a thumbscrew. The needlepoint is viewed through a reading microscope, and its point of contact with the mercury surface can be gaged accurately.

"The zero reading of the apparatus is taken when the needlepoint just touches the mercury surface and the water level in the burette tube stands near the top. The brass cap is then taken off, and soil in the form of a ball is placed on the mercury surface and pushed down with the prong of the steel rod when the cap is replaced in the same position. As a result of the added soil volume, the mercury surface rises. The water level in the burette tube is then gradually brought down, by opening the lower pinchcock, till the contact is again just made. The fall in the water level is then proportional to the volume of the soil ball, and once the apparatus is calibrated the readings can be taken in a very short time. Calibration of the instrument is carried out by adding a known weight of mercury to the U-tube, after taking the zero reading, and noting the change in the level of the water level produced thereby. The desired magnification is produced firstly because the density of mercury is higher than that of water, and secondly because the diameter of the limb attached to the burette tube is smaller than the other."

An apparatus of high sensitivity can have only a short total range, since it is not convenient to have a burette tube longer than 100 cm, and consequently it is not possible to measure volumes larger than from 3 to 4 cc. "This defect is remedied by taking the zero reading with a glass ball of predetermined volume (4 to 5 cc). This volume is added to the soil volume when readings with the latter are taken. The total volume changes due to shrinkage are then comparatively greater, since the soil volume is larger."

The shrinkage curves of four soils are shown. It was found that the nature of the exchangeable ions in the soils examined had no appreciable effect upon the form of the shrinkage curve.

An electrometric-titration method of finding the pH value and lime requirement of soils, A. N. Puri and B. Anand (*Soil Sci., 37 (1934), No. 1, pp. 49–58, figs. 2*).—A simple electrometric-titration method of determining pH value and lime requirement of soil is described in a contribution from the Irrigation Research Institute, Lahore, India.

The method makes use of two antimony electrodes, one dipped in the soil suspension and the other in a "universal" buffer solution, the pH of which is continuously varied until a galvanometer through which the two electrodes are joined together shows no deflection, the whole operation of finding pH values being in this way reduced to a simple titration. It is noted that "lime requirement methods that aim at bringing the soil to a definite pH value can be carried out easily by the technic described in the paper."

Oxidation reduction potentials in soils.—I, Principles and electrometric determination, L. A. Brown (*Soil Sci., 37 (1934), No. 1, pp. 65–76, fig. 1*).—Principles of oxidation reduction potentials applicable to biological systems are briefly viewed. Report is made upon a comparison of 70 methods (details of 50 are given) of measuring oxidation reduction potentials. In the method proposed, "soil [is] very near its condition in the field when potential is measured. Each determination consumes a comparatively short period of the analyst's time. Little equipment other than that used in the electrometric measurement of pH is needed." The soil and water mixture is thoroughly rubbed together with a pestle, the electrode is inserted, and the whole is centrifuged to insure intimate contact. The Eh is read immediately. "Potentials obtained by this method are comparative and have a deviation of the mean of not more than 0.003 v."

Influence of soil acidity upon the decomposition of organic matter in soils, J. W. White, F. J. Holben, and C. D. Jeffries (*Soil Sci., 37 (1934), No. 1, pp. 1–14, figs. 2*).—The effect upon the respiratory capacity and organic matter decomposing power of six soils of the various degrees of acidity shown by pH values of 7.4, 7.1, 6.0, 4.5, 3.8, and 3.2 were measured at the Pennsylvania Experiment Station in the cases of 260-lb. samples prepared by adding from 0.0 to 0.6 percent of sulfur to a mixture of Hagerstown silt loam 5 parts and sewage sludge and fine sand each 1 part, and incubating in small board-walled field plats for 2 yr. The organic materials added included cellulose, manure, cottonseed meal, and starch. The influence of the addition of soluble nitrogen, of dipotassium phosphate, and of hydrated lime was also studied. The data include results obtained both from the air-dried soils and from those taken later from the small plats and incubated without air drying. The respiration experiments were carried out in liter side-neck filter flasks and the carbon dioxide measured at 2-day intervals by absorption in a train of soda-lime tubes. The data from the soils made acid by the oxidation of applied sulfur were supplemented with additional studies of limed and unlimed soils which had received similar fertilizer treatment for about 50 yr.

A close correlation between the reaction of the six soils and their respiratory capacity and organic matter decomposing power was observed. Soluble nitrogen added to soils treated with organic materials and to soil alone increased the carbon dioxide production of all six soils but did not restore the activity of the acid soils to one comparable with that of the soils of pH 7.4 and 7.1. An application of dipotassium phosphate to the soil+cellulose+nitrogen treatment had little effect either in stimulating carbon dioxide production or in changing the relative cellulose decomposing power of the six soils. Lime applied to the four acid soils 30 days prior to the respiration studies followed by the addition of the cellulose+nitrogen restored the acid soil to a carbon dioxide production capacity comparable with that of the two alkaline soils. Air drying the six soils greatly stimulated the production of carbon dioxide as compared with that of the fresh-screened soil. The relative respiratory capacity and cellulose decomposing power of the two sets of soils were quite similar, however.

"The respiratory capacity and organic matter decomposing power of the six soils run parallel with the number of soil micro-organisms present, in the case both of the air-dried soils and of those incubated without air drying. Lime stimulated both the production of carbon dioxide of the acid soils and the number of soil micro-organisms. The limed soils of the old fertilizer plats show a cellulose decomposing power 41.6 percent in excess of that of the unlimed soils."

Raw organic matter accumulations under various systems of culture, H. H. Finnell (*Oklahoma Sta. Bul. 216* (*1933*), *pp. 12*).—Accumulations of "unassimilated" organic matter in the surface 6 in. of 22 plats of heavy silt loam soil at Goodwell, Okla., were determined through a period of 9 yr. by means of a flotation method which is described in working detail.

Quantities of the raw organic matter ranging from 100 to 3,000 lb. per acre were found.

Close-drilled crops maintained the greater quantities of raw material. The surpluses from widely-spaced sorghum were no greater than those produced by small weed growths on continuously fallowed plats. "The more marked fluctuations appeared to be the results of variations in rainfall quantity and distribution affecting the rate of decay. Maximum increases of raw organic matter following a wheat crop appeared at from 6 to 18 mo. after harvest, depending on the time the stubble was turned under. The rate of disappearance of wheat residues after 18 mo. was estimated to average 83.7 p.p.m. on a basis of dry soil during the first 12 mo., and 129.4 p.p.m. during the next 12 mo., which left in separable form only 14.4 p.p.m. of the residue from a crop grown 3 yr. previously.

"The manner of tillage seemed to have some influence on the rate of decomposition. The disappearance was slower at the start under listing than under plowing, but was greatly accelerated during the latter period and in the end reduced the surplus of raw material to the lowest point." Means of controlling the excess quantity or organic matter, however, are considered to consist in the removal of surface residue, choice of the time and manner of turning under residues, and the selection or spacing of crops.

"The correlation of average raw organic matter accumulations with average nitrate nitrogen accumulations under various cropping plans showed significant negative relations, but the annual fluctuation of nitrate nitrogen appeared to be governed by some more strongly related factor, such as movement of soil moisture."

Causes of "inactivity" of Azotobacter [trans. title], D. Novogrudskiĭ (Nowogrudsky) and A. Naumova (Naumowa) (*Mikrobiologiia, 1* (*1932*), *No. 2, pp. 181–191; Ger. abs., pp. 190, 191*).—*Azotobacter*-like organisms were found microscopically in soils, yet these could not be developed by any of the cultural methods.

Inoculation of the soil with active cultures of *Azotobacter* showed that the organism could not survive there. By using the method of Uspensky and Kruchkova (a modification of Winogradsky's method—"cultures spontanées"—

by preparing the soil disk on a drainage bed of coal) and introducing Ca and P in addition to mannite, profuse growth of *Azotobacter* was obtained from inoculated soil, as well as from the soil that seemed to be devoid of the organism. The chief factor encouraging the growth of *Azotobacter* was the drainage. Sterilization of the soil had the same effect.—(*Courtesy Biol. Abs.*)

On the stimulation of the growth of Azotobacter by mineral substances and soil extracts [trans. title], K. KONISHI and T. TSUGE (*Bul. Agr. Chem. Soc. Japan, 9* (*1933*), *No. 1–3, pp. 23–26*).—The authors found more intense spectral emission lines of vanadium in the water extract from a good soil than in that from a poor soil, and express the opinion that difference in vanadium content is a factor importantly affecting the growth of *Azotobacter* in a solution culture.

The economy of soil nitrogen under semiarid conditions, H. H. FINNELL (*Oklahoma Sta. Bul. 215* (*1933*), *pp. 22, fig. 1*).—Topsoil nitrogen content was shown by analyses of samples from 22 plats at Goodwell, Okla., during a period of between 7 and 8 yr. to vary with the cropping practice from an average annual loss of 38.08 lb. per acre to an annual gain of 5.74 lb. per acre.

In cropping systems using various combinations of wheat and fallow the nitrogen losses from topsoil were roughly in proportion to the extent of fallowing employed. Topsoil nitrogen losses averaged more where wide spacing of the crop was used than where close spacing was used. Under continuous wheat, Sudan hay, and closely-spaced milo, the topsoil nitrogen was maintained with slight gains. After 8 yr. of diverse field management the balance of residual nitrogen was approximately the same in the 6-ft. soil section of plats intensively cropped as in comparable plats lightly cropped. Continuous cropping concentrated the total nitrogen nearer the surface than did systems employing summer fallowing. All observations indicated that permanent losses of nitrogen from the root zone by leaching were increased by fallowing. The balances of total nitrogen in the soil, added to increased yields of nitrogen in crops removed, gave intensive cropping a net annual nitrogen economy advantage over fallow cropping of from 15 to 30 lb. of nitrogen per acre.

A laboratory study of the soil in question indicated a nitrogen-fixing flora, the activity of which was slightly increased by the addition of straw during an incubation period of 2 yr.

Studies on nitrogen losses of animal excrements and stable manure [trans. title], B. CHROSTOWSKI (*Rocz. Nauk Rolnicz. i Leśnych* (*Polish Agr. and Forest Ann.*), *30* (*1933*), *No. 2, pp. 33–272; Eng. abs., pp. 271, 272*).—Investigating the possibility of a direct oxidation of ammonia or organic nitrogenous compounds to free nitrogen, the author found that during decomposition of horse manure, either free from nitrifying bacteria or inoculated with these micro-organisms, there was volatilization of ammonia only in quite insignificant quantities, and that no losses of free nitrogen took place. It is considered that the increase of nitrogen found at the end of the experiment may be explained partly by the inaccuracy of the nitrogen determination. Also in the experiments with horse dung decomposed in presence of air, no loss of nitrogen was found. Results of experiments with urine showed that nitrification and some loss of nitrogen took place in a solution of horse urine, but only when certain mineral salts had been added and when the concentration of urine did not exceed about 30 mg in 100 cc of solution.

By mixing fresh, aseptically gathered horse excrements with sterilized straw, a synthetic manure was produced for the purpose of studying its decomposition in an oxygenous atmosphere or under aerobic conditions. From stable manure free from nitrifying bacteria, during an even vigorous decomposition no gaseous nitrogen was liberated; nor were there any losses from stored manure which had been purposely inoculated with nitrifying bacteria. After inoculation with nitrifying bacteria a vigorous nitrification occurred in manure with a C:N ratio of about 19:1; this manure also lost about 15 percent of its nitrogen in gaseous form. In two other manures with a C:N ratio of 21:1 and 26:1, respectively, there was no evident nitrification. It is considered to be, therefore, assumable that the C:N ratio of 20:1 is a limiting one; at the wider ratio a vigorous nitrification is said to be possible only after a considerable period of rotting. It is further recorded that evolution of free nitrogen took place also in uninoculated manure with a narrower C:N ratio; loss of nitrogen in this case was even greater than in the same manure inoculated with nitrifying bacteria. To explain this difference the author offers the hypothesis that nitrifying bacteria transforming a part of the ammonia into nitrates protect it from oxidation into free nitrogen by unknown microorganisms.

Fertilizer analyses for different North Carolina crops, including the best percentages of water-insoluble nitrogen of totals in fertilizer mixtures recommended (*North Carolina Sta. Agron. Inform. Circ. 85 (1934), pp. [1]+13*).—This circular contains statements of the composition of fertilizer mixtures "suitable for use in the quantities indicated for crops when grown on different soil groups in an average state of productiveness", together with "the recommendations of the department of agronomy with reference to the most suitable water-insoluble nitrogen content of fertilizer mixtures for different crops grown on different classes of soils in average condition of the three main soil provinces of the State."

Commercial fertilizers, 1933, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 149 (1933), pp. 69–96*).—Analyses of 365 commercial fertilizer samples are reported, including the determination of magnesium in mixtures claiming definite contents of that element.

AGRICULTURAL BOTANY

[Plant physiology studies of the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 96, 97, 98, 99*).—Results are briefly noted of studies by L. Knudson on delayed photosynthesis in chlorophyll-bearing embryos of orchids and on direct absorption and utilization of amino acids by plants; by E. F. Hopkins on the effect of iron-ion concentration on the growth of *Chlorella* and *Euglena gracilis* and on the relation of copper to growth; and by Knudson on the influence of X-rays on growth and metabolic processes in *Bryophyllum*.

A further note on catalase activity as a measure of seed viability, C. W. Leggatt (*Canad. Jour. Res., 9 (1933), No. 6, pp. 571–573*).—"Application of statistical methods to the results of an investigation previously published has shown that viability, in the case of common wheat, may be estimated fairly closely from a determination of total and thermostable catalase; a determination which may be completed within the course of a few hours as compared with the regular germination test requiring 12 days. Much work is yet required, however, to put this method on a practical routine basis." Immaturity is accompanied by high total catalase content which, in turn, is associated with low catalase ratios. Apparently immature seeds have a greater proportion of thermolabile catalase. It is suggested that during the ripening of the seed the thermolabile catalase (Loew's catalase?) becomes condensed to the thermostable condition, and that since the proportion of thermostable catalase to total catalase decreases with decreasing viability one of the processes accompanying loss of viability is either a gradual reconversion of the thermostable catalase into the thermolabile condition or a destruction of the thermostable catalase directly, or a combination of both processes.—(*Courtesy Biol. Abs.*)

Studies in the morphology and biochemistry of the pineapple.—II, Reserves in the seeds of two genera of the Bromeliaceae and of various pineapple hybrids, L. E. Holmes (*New Phytol., 32* (*1933*), *No. 5, pp. 382–392, fig. 1*).—Carbohydrate, nitrogen, and water content determinations were made on the resting and germinating seeds, and seedlings of 11 varieties of *Ananas sativus*, mostly of hybrid origin, also *Bromelia pinguens*. There was a considerable range in content of the principal food store—carbohydrate.

The varieties investigated differ from the majority of seeds in having a high reducing sugar content.—(*Courtesy Biol. Abs.*)

The conversion of fat to carbohydrate in the germinating castor bean, I–III (*Jour. Gen. Physiol., 17* (*1933*), *No. 2, pp. 283–302, figs. 2; 303–309, figs. 2; 311–325, fig. 1*).—Studies at the University of Rochester are here reported.

I. *The respiratory metabolism*, J. R. Murlin et al.—Respiration studies on single castor-beans made by means of the Brodie-Warburg method at various times after the start of germination, as well as studies on groups of germinating beans over periods of from 3 to 8 days, made by a simple procedure involving analysis of the respired air by the Haldane method, consistently gave respiratory quotients from 0.3 to 0.58, indicating the conversion of the oil to carbohydrate. "The r.q. varies with the stage of germination, the lowest point occurring when the new growth (hypocotyl) measures from 20 to 35 mm in length. The r.q. of the young plant (cotyledons and hypocotyl), separated from the endosperm and studied in the same apparatus, varies from 0.78 to 1.00. It is invariably high enough to indicate considerable combustion of sugar. The r.q. of the endosperm alone is low, but usually somewhat higher than that of the entire germinating structure. On the same unit of moist weight the young plant (cotyledons and hypocotyl) produces about 2.6 times as much CO_2 as the endorsperm, whereas it absorbs only 1.3 times as much O_2."

II. *The combustion respiratory quotient as determined by a modified oxycalorimeter*, R. G. Daggs and H. S. Halcro-Wardlaw.—The combustion respiratory quotients of castor-beans germinated to various stages, depending upon the length of the hypocotyl, were determined by means of a modified oxycalorimeter. After germination was well started, the r.q. of the combusted germinated seed increased as the stage of germination increased, indicating a change from an oxygen-poor to an oxygen-rich substance, probably fat to sugar. The accuracy of the method was checked by organic combustions. "The seat of formation of the oxygen-rich substance is in the endosperm."

III. *The chemical analysis, and correlation with respiratory exchange*, H. B. Pierce, D. E. Sheldon, and J. R. Murlin.—Analyses for fat (ether extract), protein (N×6.25), sugar, including glucose, crude fiber, and ash have been made on all stages of the germinating castor-bean up to 250 mm length of hypocotyl and root system.

"There is a continual decrease in the amount of fat present in the whole germinating seedling, and a continual increase in the amount of sugar up to about 40 percent (dry weight) at a hypocotyl length of 80 to 140 mm, after which it decreases as crude fiber (cellulose) increases. The most rapid decrease in fat content coincides roughly with the most rapid increase of sugar. The carbon balance between fat loss and carbohydrate (including fiber) gain is not at all close, except at the very beginning of growth. An undetermined residue occurs which increases steadily along with the total carbohydrate and accounts for more and more of the carbon. The protein content, which in the ungerminated bean is about 26 percent, at first falls a little and then rather steadily increases to reach nearly 35 percent (dry) at the last stages studied. The most plausible explanation of this is the occurrence of more and more volatile substance, which is lost in drying. The ash increases irregularly but in the end shows about the same ratio of increase as the protein.

"Respiration studies on several lots of these beans at different stages of germination exhibited the same low respiratory quotients as reported. . . . Comparing their composition at the end of the respiration period with that of corresponding stages when the period began, the chemical change can be compared with the respiratory exchange.

"A trial balance of all the carbon changes, including the respiratory carbon and protein carbon, is not very satisfactory because of our ignorance of the undetermined residue. The respiratory quotient found can be accounted for quite satisfactorily on the assumption that two out of six molecules of ricinoleic acid are converted to cane sugar, one to cellulose, and three are oxidized. The oxygen needed to produce the quantities of known carbohydrate found, added to that used for combustion and the total subtracted from the observed loss from the respired air, yields in two experiments a quantity which, combined with the excess carbon, suggests that the undetermined substance may be an oxidation product of pentose."—(*Courtesy Biol. Abs.*)

Studies of the physiological importance of the mineral elements in plants.—V, The distribution of diastase, invertase, and catalase in normal and potassium-starved bean plants, M. CATTLE (*New Phytol., 32 (1933), No. 5, pp. 364–381, figs. 3*).—Invertase activity in normal plants is highest in the top leaves, falling rapidly in the second and third, and remaining uniformly low in the more mature leaves. In potassium-starved plants invertase activity in the top and second leaves is less than in the normal, but in the lower more mature leaves it is higher than in the normal.

The distribution of catalase and diastase are similar, there being an increase from the top to the second leaf, then falling rapidly and remaining uniformly low in the more mature lower leaves. While the trend is similar for normal and starved plants, activity is slightly less in the latter.—(*Courtesy Biol. Abs.*)

Enzymes and salt ions.—III, Saccharogenic amylase of leaves of differently fertilized potatoes [trans. title], G. VON DOBY and E. SZLADITS (*Hoppe-Seyler's Ztschr. Physiol. Chem., 206 (1932), No. 4–5, pp. 177–186, figs. 3*).—The saccharogenic amylase activity of leaves of potato plants grown on acid moor soil and those fertilized with potassium on the one hand and potassium, phosphate, and calcium on the other were investigated. The optimum pH was 6.75 and the optimum temperature 38.8°. Regardless of the media, the amylase decreased with the aging of the plant but was highest in poorly nourished plants. NaCl, NaF, and KCl in concentrations of 0.001–0.1 N showed an activation dependent on the media, 0.001 N NaF activating strongest in the poorly nourished plants, while 0.1 N inhibited in completely fertilized plants. Autolysis caused an activation of 40 percent in unfertilized plants, while those fertilized lost activity on autolysis. Salts accelerate autolysis at pH 6.75, the magnitude depending on the state of nutrition. Amylase activity and rate of autolysis are criteria of the nutritional state.—(*Courtesy Biol. Abs.*)

The role of the organic acids in plant metabolism, III, T. A. BENNET-CLARK (*New Phytol., 32 (1933), No. 3, pp. 197–230, figs. 4*).—The third and concluding article of the series (E.S.R., 70, p. 166) deals with acid metabolism of the mold fungi and the formation of the plant acids in protein metabolism. A general conclusion and summary for the series is added. "The plant acids are possibly convertible into amino acids and proteins, complex products such as the alkaloids, and by reduction into the parent substances of the fats, and also into carbohydrates. Thus they may form some essential links in the processes by which the energy of respiration is transferred to the varied synthetic activities of the plant. It is certainly clear that they are by no means waste products of metabolism."—(*Courtesy Biol Abs.*)

The action of the plant growth hormone, J. Bonner (*Jour. Gen. Physiol., 17 (1933), No. 1, pp. 63–76, fig. 1*).—The action of the plant growth hormone in bringing about elongation of the *Avena* coleoptile was investigated. Sections of the coleoptiles, if cut from the plant and suspended in solution of the growth hormone, showed considerable elongation. This elongation was stopped by the absence of O_2 and by the presence of KCN (10^{-3} N), or phenyl-urethan (0.05 percent). The rate of respiration of the sections was measured, using the method of O. Warburg. The respiration was slightly increased by the hormone preparations used in the concentrations of hormone, which also caused growth. This increase in respiration, as well as the normal respiration, was inhibited by the same concentrations of KCN and phenyl-urethan which inhibited growth. A close connection between respiration and elongation is thought possible.—(*Courtesy Biol. Abs.*)

Growth-promoting substance and illumination, A. E. Navez (*Natl. Acad. Sci. Proc., 19 (1933), No. 6, pp. 636–638*).—Seedlings of *Lupinus albus* were grown under controlled (identical) conditions of temperature and moisture in (1) artificial light and (2) in darkness. When the hypocotyl was from 3.5 to 4 cm long (i.e., before the characteristic elongation could begin in the seedlings in darkness) they were decapitated (cut from 2 to 3 mm below insertion of cotyledons), and the part was put for one hour on a block of agar. The auxin content of the agar block was estimated by the technic of H. Dolk (1931) and of the author (1932), using decapitated coleoptiles of *Avena* as test objects. The illuminated seedlings were found to have released about twice as much auxin into the agar blocks as the nonilluminated seedlings.—(*Courtesy Biol. Abs.*)

The nature of the cambial stimulus, R. Snow (*New Phytol., 32 (1933), No. 4, pp. 288–296, figs. 3*).—The experiments were designed to test whether the cambial stimulus can cross a protoplasmic discontinuity. Pea and sunflower seedlings were grown in pairs. A lower internode of the former and a portion of the hypocotyl of the latter were split longitudinally, and the split halves were cut at opposite ends. The open ends were then extended toward one another in order to make a graft, though both plants were kept on their own roots. The sunflower strips were on the lower end and were examined at 2 or 3 mm below the zone of contact after from 22 to 24 days. The cambium had become active both in and between bundles, and the pith cells had divided in several instances.

Similar experiments were performed on pairs of plants of the same species (*Vicia faba*). A piece of moist linen or muslin was placed between the components in certain instances, but the results were the same in either case.

Inasmuch as the controls did not show cambial activity in corresponding regions, it was concluded that the cambial stimulus could cross a protoplasmic discontinuity in a downward direction and, further, that like the growth regulator of the coleoptile, it can act upon a plant of a widely different family. Even though the cambial stimulus promotes cell division and not cell extension like the growth regulator, its ability to travel only downwards, etc., leads the author to interpret it as probably a hormone.—(*Courtesy Biol. Abs.*)

The relation between water-content, chlorophyll-content, and the rate of photosynthesis in some tropical plants at different temperatures, R. H. Dastur and B. L. Desai (*Ann. Bot.* [*London*], *47 (1933), No. 185, pp. 69–88,* *figs. 6*).—The relationships between moisture content and assimilation and chlorophyll content and assimilation were studied. Experiments were conducted with several different kinds of tropical plants, all of which were potted. The data presented show that the water content of the leaf was an important internal factor to which the photosynthetic activities of the leaves were related. In the case of all plants investigated, the CO_2 assimilation of leaves was more clearly related to water content than to chlorophyll content.—(*Courtesy Biol. Abs.*)

The behaviour of dyes in the transpiration stream of sycamores (Acer pseudoplatanus L.), H. Baker and W. O. James (*New Phytol., 32 (1933), No. 4, pp. 245–260, figs. 7*).—Dyes were applied in summer to 4- and 5-year-old stems in the following ways: (1) Stepping cut branches into pots of solution, (2) boring under water and replacing the water with dye solution, (3) boring under water and stuffing the bores with dye crystals, and (4) application of dye solutions to the surface of exposed wood. Evidence supports the hypothesis that the greater part of the water is moved upward in nonliving cells by transpiration, and that the water is under considerable tension. The dyes failed to move in the bark or pith, but moved both upward and downward in the xylem. Radial and tangential movement occurred during the passage of the dye in either direction.

Rates of movement are recorded.—(*Courtesy Biol. Abs.*)

Sap pressure and the movements of sap, W. O. James and H. Baker (*New Phytol., 32 (1933), No. 5, pp. 317–343, figs. 9*).—Another study of exudation of sap by roots and lower portions of stems shows that sycamore roots and stems take up dye solutions readily even when actively bleeding. Microscopic examination showed that the dye had passed along the vessels and also into nonliving fibers. Observations of the cut surfaces showed the sap exuding from living cells, especially those of the cambial zone (including the region of differentiating xylem and phloem mother cells), and not from the vessels. Many cells of the cambial zone were interpreted as young sieve tubes with open sieve plates at the bleeding period.

The literature, with few exceptions, gives no adequate evidence to demonstrate that exudation takes place from vessels, but there are some instances which may be interpreted as meaning that the water in the vessels is under slight tension even while bleeding is going on. Such evidence of tension is supported by this work. The positive hydrostatic pressures associated with bleeding and exudation exist in the living cells, and the sap movements due to them are reported to take place principally in the phloem.

Conditions necessary for such movement are described, and the probable similarity between the pressures involved in exudation and translocation is pointed out. The term "sap pressure" is suggested.—(*Courtesy Biol. Abs.*)

Tree roots and the field layer, A. S. Watt and G. K. Fraser (*Jour. Ecol., 21 (1933), No. 2, pp. 404–414, figs. 3*).—By cutting to different depths the roots of *Pinus sylvestris* in the podsolized soil of a heath pine wood in Aberdeenshire, Scotland, the weight of the crop of both the deep-rooting *Deschampsia flexuosa* and the shallow-rooting *Oxalis acetosella* was increased with the depth of cut. The same results on *Oxalis* were got by cutting the roots of beech on the same soil. Water added to the surface and at 10 cm and 20 cm from the mineral soil surface produced crop weights similar to the control. With greater depth of cut the foliage of *Deschampsia* and *Oxalis* became darker green, and generally the number of flowering shoots of *Deschampsia* increased, although in the deepest cut many aborted. The percentage of N_2 in *Deschampsia* also increased with depth of cut up to a certain point.

The experiment shows that the deeper-lying pine roots affect the vigor of both the deep-rooting *Deschampsia* and the shallow-rooting *Oxalis*, and raises afresh the concept of edaphically complementary species.—(*Courtesy Biol. Abs.*)

Inhibition of selenium injury to wheat plants by sulphur, A. M. Hurd-Karrer (*Science, 78 (1933), No. 2033, p. 560*).—The toxicity of selenium to wheat was observed to be inversely proportional to the sulfur supply in the soil solution, a large supply of sulfur permitting normal development. No injury in water cultures was apparent when the ratio of selenium to sulfur was 1:12 or less.—(*Courtesy Biol. Abs.*)

An improved method of bleaching and clearing leaves, R. W. Strain (*Phytopathology, 24 (1934), No. 1, pp. 82–84*).—Leaves and petals were quickly bleached by the action of alcohol into which was introduced nascent chlorine. This treatment, followed by the use of a clearing solution (Aumann's solution) rendered the material under investigation suitable for accurate study of vein endings. epidermal or palisade cells, stomata, and crystals.

GENETICS

A study of some species and types of Phleum, Phalaris, and Festuca with regard to chromosome numbers and breeding properties, B. L. Sethi (*Indian Sci. Cong. Proc. [Calcutta], 19 (1932), pp. 312, 313*).—Cytological studies showed 7 as the basic chromosome number in each genus. These studies and breeding work suggested that extreme or pronounced differences in chromosome numbers make interbreeding difficult. Thus in *Phleum*, while different morphological types interbreed quite readily provided they have the same number of chomosomes, diploid and hexaploid types can only be intercrossed with great difficulty. Similar results were obtained in *F. ovina* and various morphological types of *F. rubra*. Types similar in chromosome numbers intercrossed quite readily, but attempts to intercross *F. ovina* (tetraploid) and *F. rubra* (hexaploid) gave very poor results. On the other hand, the two *F. rubra* types, hexaploid and octoploid, intercrossed quite readily in both directions, suggesting that even where the chromosome numbers are different, if the difference is not very great initial intercrossing at least is readily possible. The two *Phalaris* species studied (*P. arundinacea* and *P. bulbosa*) have the same chromosome number and yet are not easily intercrossable, while the hybrid produced bears only a very small proportion of good pollen grains. Although the chromosome numbers in the two parents are the same, the chromosomes themselves are not identical since in reduction division faulty pairing occurs, which results in the formation of imperfect pollen grains. See also another note (E.S.R., 68, p. 32).

Calculating linkage intensities from F_3 data, F. R. Immer (*Genetics, 19 (1934), No. 2, pp. 119–136, figs. 3*).—The estimation of linkage intensity from F_2 data and F_3 data of various kinds is illustrated.

Relation of the differential fertilization genes, Ga ga, to certain other genes of the Su-Tu linkage group of maize, R. A. Emerson (*Genetics, 19 (1934), No. 2, pp. 137–156*).—This contribution from Cornell University discusses the effect of the genes *Ga ga* in causing deviations from normal 3:1 and 1:1 ratios in corn, reviews the results of other investigators showing the relation of *Ga ga* to De_1 de_1, De_{16} de_{16}, *Su su*, and presents data on the relations of *Ga ga* to *Su su*, Ts_5 ts_5, and *Tu tu*. Methods of evaluating the effectiveness of *Ga ga* and of determining recombination percentages also are discussed. The relations of the six genes considered are summarized in terms of their linear order and approximate spacing on the genetic map as follows: de_1 35 *Ga* 20 Ts_5 14 *su* 3 de_{16} 26 *Tu*.

Unisexual maize plants and their relation to dioecism in other organisms, D. F. JONES (*Natl. Acad. Sci. Proc., 20 (1934), No. 1, pp. 39–41*).—The genetic behavior and characteristics of dioecious corn, developed by combining two recessive genes, tassel-seed-2 and silkless, located on different chromosomes, are described briefly from studies at the Connecticut [New Haven] Experiment Station.

Inheritance of characters in rice, J. W. JONES (*Jour. Agr. Res. [U.S.], 47 (1933), No. 10, pp. 771–782*).—The inheritance of length of glumes, absence of ligules, brittleness, shattering, dwarfness, awns, color of awns, glumes, and apiculi, and earliness was studied in the F_1, F_2, and F_3 generations of several rice hybrids grown cooperatively at the Biggs (Calif.) Rice Field Station by the U.S. Department of Agriculture and the California Experiment Station.

In the varieties used, long (outer) glumes, absence of ligules, brittleness of culm, shattering of grain, and dwarfness were recessive to the normal characters. The awned and partly awned rices were dominant to awnless varieties. Fully awned varieties appeared to differ from awnless varieties by two genetic factors, and from partly awned varieties by a single genetic factor. The partly awned varieties also differed from awnless rice by a single genetic factor. The red color in the awns, glumes, and apiculi in varieties used was dominant to green (straw color). Ratios of 3:1 and 9:7 were obtained, which suggested that color was due to a single genetic factor and to two complementary factors. Yellowish brown lemma and palea furrows were dominant to green, and appeared to be inherited independently of long glumes.

Cyto-genetical studies on the wild and cultivated Manchurian soy beans (Glycine L.), Y. FUKUDA (*Japan. Jour. Bot., 6 (1933), No. 4, pp. 489–506, pls. 2, figs. 7*).—The developmental processes of pollen grains of *Glycine* spp. are described as regular and resembling those of other species of legumes. The haploid and diploid chromosomes numbered 20 and 40, respectively, in *G. hispida*, *G. gracilis*, and *G. soja*. The chromosomes were similar in shape and number in *Glycine* spp. Data are given on seed weight and genetical differences of the several species, and remarks made on the possible origin of soybeans.

Karyogenesis in the chrysanthemum [trans. title], N. SHIMOTOMAI (*Jour. Sci. Hiroshima Univ., 2 (1933), Art. 1, pp. 100, pls. 10, figs. 53*).—Studies at Hiroshima University, Japan, upon the chromosome number and behavior in a large number of native chrysanthemum species and in cultivated forms leads to the conclusion that most of the garden varieties have arisen from wild species possessing 54 diploid chromosomes. The basic number of chromosomes in the chrysanthemum family was 9, but wild forms with n, 2n, 3n, 4n, and 5n complements were observed. Where crosses were made between parental forms differing in chromosome number, the seedlings more closely resembled in outward form the higher numbered parent. Because of the fact that wild chrysanthemums with basic or low chromosome numbers occur largely in the mountains while high polyploidal forms occur only on the seacoast, the author concludes that environment is a factor in the development of polyploidy.

[Breeding tailless sheep] (*South Dakota Sta. Rpt. 1933, p. 16*).—A brief note is given of progress in the production of a tailless breed of sheep having other desirable characteristics.

Size inheritance in rabbits; further data on the back-cross to the small race, W. E. CASTLE (*Jour. Expt. Zool., 67 (1934), No. 1, pp. 105–114*).—Continuing the studies of size inheritance in the rabbit (E.S.R., 62, p. 323; 68, p. 751), data are reported on the weights of 80 male and 80 female individuals produced in the back-cross generation of F_1 Checkered Giant-Polish females to the small race (Polish) males. These data, together with those for the three-fourths large-race population, were analyzed with reference to the linkage of size with the four contrasting color genes introduced from the two parent stocks.

No significant relationships were observed between the size of the offspring and the color genes for dilute, yellow, and non-English or other allelomorphs. The back-cross agouti young were slightly heavier than the nonagoutis—117±25.8 g in the new and old data for males and females combined. In view of the fact that among females nonagoutis were heavier in the new data, and the doubtful significance of the combined material, it is suggested that racial size differences are not due to the action of the chromosomal genes but may be due to cytoplasmic differences.

Further evidence of linkage in size inheritance, C. V. Green (*Amer. Nat., 67 (1933), No. 711, pp. 377–380*).—Further evidence of linkage between size and color characters in the *Mus musculus* × *M. bactrianus* cross (E.S.R., 66, p. 820; 67, p. 231) is presented, based on the F_2 population. These data showed no difference in the weights of the dilute and intense mice, but browns were heavier than blacks by more than four times the probable error of the difference in both the back-cross and F_2 generations. Nonagoutis were heavier than agoutis in both generations, but the differences were small. The conclusion that genes for size are located on the same chromosome as the gene for brown seems confirmed by the F_2 generation.

Inheritance of a white star in the deer mouse, E. Barto and R. R. Huestis (*Jour. Heredity, 24 (1933), No. 6, pp. 245–248, fig. 1*).—Data are reported dealing with the inheritance of a character designated as "star" and consisting of a patch of white hairs near the mid-dorsal line about half way between the eyes and the pinnae. Selected cage-born individuals produced larger stars. There were white ventral spots in 14±0.84 percent of the mice showing stars.

Absence of the corpus callosum as a mendelizing character in the house mouse, C. E. Keeler (*Natl. Acad. Sci. Proc., 19 (1933), No. 6, pp. 609–611*).—Continuing these studies (E.S.R., 68, p. 465), data are reported on matings of mice with and without the corpus callosum. In matings of normals with abnormals there were produced 82 normal individuals; in matings of normal heterozygotes with normal heterozygotes, 59 normals and 16 abnormals; in back-crosses of abnormals with normal heterozygotes, 45 normals and 62 abnormals; and 1 normal individual occurred among the 47 produced by matings of abnormals with abnormals, which is explained as due to the accidental transfer of an individual from another cage. With this exception the data fit in with the interpretation that the absence of the corpus callosum is due to the expression of a single recessive gene.

Hybridizing diamond-back terrapins, S. F. Hildebrand (*Jour. Heredity, 24 (1933), No. 6, pp. 231–238, figs. 2*).—A brief account is given of the cross-breeding of the Carolina terrapin (*Malaclemmys centrata*) with the Texas terrapin (*M. pileata*). Data are presented on the growth and fertility of the crossbreds. It is of interest that females continued to lay fertile eggs even during the third breeding season after separation from males. There seemed to be an excess of males among the hybrid offspring.

The genetics of Habrobracon, C. H. Bostian (*North Carolina Sta. Rpt. 1932, p. 79*).—Data reported on the factors concerning the production of biparental males in the parasitic wasp and tests of linkage relationships between the more than 40 known factors.

[Studies on the physiology of reproduction] (*[New York] Cornell Sta. Rpt. 1933, pp. 85, 86*).—Results are briefly reported of studies of the relationship between ovarian hormones and mammary development and function, by S. A. Asdell, G. W. Salisbury, J. C. Woodward, and P. C. Kelly; inheritance of a short-ear character in goats, by Asdell; and the relationship between spermatozoa development when the testicle is placed in the abdomen and after it is returned to the scrotum, by Asdell and Salisbury.

Mucification of the vaginal epithelium of immature mice following injections of follicular fluid, S. B. D. Aberle (*Science, 78 (1933), No. 2010, pp. 17, 18*).—Tests of the influence of follicular fluid from sows' ovaries on 20 immature mice showed that mucification of the vaginal epithelium was caused for about 60 hours following the injection.

A translocation in the house mouse and its effect on development, G. D. Snell, E. Bodemann, and W. Hollander (*Jour. Expt. Zool., 67 (1934), No. 1, pp. 93–104, figs. 5*).—It was observed that X-raying male mice reduced the size of litter produced when they were mated with normal stock. One male so treated produced an average of 3.7 young per litter, as compared with about 8 per litter in the normal stock. An embryological study of matings of this kind showed that the usual number of zygotes were formed, but approximately 42 percent were nonviable and a portion developed into abnormal monsters. Twenty-seven young from matings of the X-rayed semisterile males with normal females were tested for the litter size produced, 13 of which proved to be semisterile. It is concluded that the results are best explained if the semisterility is considered as due to a translocation induced by the X-ray treatment. Matings of semisterile individuals×normal stocks produced semisterile and normal individuals and nonviable embryos approximately in the ratio 2:2:3.

The growth and gonad-stimulating hormones of the anterior hypophysis (*Calif. Univ. Mem., 11 (1933), pp. XII+446, pls. 14, figs. 68*).—Papers are reported on the present understanding of the influence of the growth and gonad-stimulating hormones of the anterior hypophysis.

Studies involving the relationship of these hormones to growth and reproduction, based largely on the results of investigations conducted at the University of California, are presented in the following papers: The Anterior Hypophyseal Growth Hormone (pp. IX–XII+1–65), Preparation and Properties of Extracts of the Gonad-Stimulating Hormone (pp. 67–149), Biology of the Gonad-Stimulating Hormones in Females (pp. 151–206), and Biology of the Gonad-Stimulating Hormone in Males (pp. 207–227), all by H. M. Evans, K. Meyer, and M. E. Simpson; Comparison of the Response to Growth Hormone of Normal and Hypophysectomized Rats (pp. 229–251), Response of Hypophysectomized Female Rats to Gonad-Stimulating Hormone (pp. 253–275), Repair of the Reproductive Mechanism in Hypophysectomized Female Rats (pp. 277–299), and Repair of the Reproductive Mechanism in Hypophysectomized Male Rats (pp. 301–313), all by Evans, R. I. Pencharz, Simpson, and Meyer; Interrelations of Hypophysis and Adrenals: Part 2, Maintenance and Repair of Adrenal and Thyroid after Hypophysectomy (pp. 315–333), by Evans, Pencharz, Meyer, and Simpson; Part 3, Repair of the Cachexia of Hypophysectomized Rats (pp. 335–342), by Evans, Pencharz, Meyer, Simpson, W. W. Swingle, and J. J. Pfiffner; and Part 4, The Effect of Anterior Hypophyseal Growth Hormone on the Survival Period of Adrenalectomized Rats (pp. 343–351), by Evans, Pencharz, Meyer, and Simpson; The Metabolism of the Immature Gonads under the Influence of Gonad-Stimulating Hormone (pp. 353–367), by A. J. Szarka, Meyer, and Evans; The Respiratory Metabolism of Rats Treated with the Anterior Hypophyseal Growth Hormone (pp. 369–396), by Szarka; The Effect of Combinations of Prolan and Hypophyseal Extract on the Atrophic Genital System of an Hypophysectomized Dog (pp. 397–408), by Evans, Meyer, Simpson, and F. L. Reichert; Replacement Therapy in an Hypophysectomized Dog with Anterior Hypophyseal Extract Rich in Growth Hormone (pp. 409–420), by Reichert, Simpson, R. E. Cornish, and Evans; and Treatment of Normal and Achondroplastic Dogs with Growth Hormone (pp. 421–442), by Evans, Simpson, Meyer, and Reichert.

The technique of artificial insemination (*Edinburgh: Imp. Bur. Anim. Genet., 1933, pp. 56, figs. 2*).—In this monograph the progress achieved in the Union of Soviet Socialist Republics, the methods employed for the collection and dilution of the sperm of various species, and its employment in artificial insemination are described. A. Walton of the University of Cambridge has written an introductory chapter on the physiology of artificial insemination.

FIELD CROPS

Report of committee on standardization of field experiments (*Jour. Amer. Soc. Agron., 25 (1933), No. 12, pp. 803–828*).—Recommended standards for field and lysimeter experiments with farm crops, revising earlier recommendations (E.S.R., 50, p. 733), are reported, with remarks on statistical analysis and application and publication of results. The enlarged and revised bibliography embraces 437 titles.

The formation of Latin squares for use in field experiments, F. Yates (*Empire Jour. Expt. Agr., 1 (1933), No. 3, pp. 235–244*).—Conditions to be fulfilled in selecting Latin square arrangements for agricultural field trials, if an unbiased estimate of error is to be obtained, are discussed, and examples of squares up to size 12 by 12 are given, from which experimental arrangements may be derived by simple processes of permutation. The totalities of all squares up to size 6 by 6 are presented in compact form.

Forage crops in the Matanuska region, Alaska, H. W. Alberts (*Alaska Stas. Bul. 11 (1933), pp. 14, figs. 11*).—Production practices and crops for silage, hay, and pasture in the Matanuska and Susitna Valleys are described from the results of experience and of research by the Matanuska Experiment Station.

Desirable crops included a 2:3 mixture of field peas and oats for silage, a 1:3 mixture of spring vetch and oats for hay, and a mixture of field peas 1 bu., oats 1 bu., and rape 4 lb. for summer hog pasture, if not overgrazed. Hay from cereal grains were not so desirable as the vetch-oats mixture. Native grasses for hay were best if cut when 50 percent of the heads had emerged. Slender wheatgrass, a good hay plant for the region, was more drought-resistant than bromegrass, which outyielded the wheatgrass in favorable seasons. They made a satisfactory mixture for hay.

[Field crops experiments in Arizona] (*Arizona Sta. Rpt. 1933, pp. 27–30, 31, 32, 63–67, 82–84, figs. 2*).—Current results in agronomic investigations (E.S.R., 68, p. 753) at the station and substations are reported from variety tests with wheat, barley, oats, grain sorghum, alfalfa, and cotton; inheritance of economic characters in pure lines of alfalfa; irrigation experiments with wheat; studies of the influence of climate, soil, and grazing on range vegetation; production tests with sesame; and cotton research comprising breeding work, effects of water shortages on internal plant structure and upon nutrition as affecting boll shedding, relation between osmotic pressures in the sap and lint length, and grade and staple estimates of the Arizona cotton crop. Several phases of the research were in cooperation with the U.S. Department of Agriculture.

[Field crops research at the Georgia Coastal Plain Station, 1932] (*Georgia Coastal Plain Sta. Bul. 21 (1933), pp. 10–53, 60–62, 71, 72, 89–94, figs. 4*).—Experiments with field crops (E.S.R., 69, p. 37) reviewed for 1932 and for various periods of years comprised variety tests with cotton, corn, oats, wheat, rye, barley, peanuts, lespedeza, soybeans, and cowpeas for hay and seed, winter field peas, vetch, crotalaria, pasture grasses, sweetpotatoes, and tobacco; a source of seed test with potatoes; breeding work with corn and oats; fertilizer experiments with cotton, corn, oats, peanuts, velvetbeans, sweetpotatoes, potatoes, and tobacco; winter cover crops for cotton and corn; cultural (including planting) experiments with oats, wheat, cotton, peanuts, soybeans, winter field peas, vetch, sweetpotatoes, potatoes, and tobacco; and pasture studies. Some of the research was in cooperation with the Georgia College of Agriculture, the Georgia Experiment Station, and the U.S. Department of Agriculture.

[Agronomic experiments in Guam], C. W. Edwards and J. Guerrero (*Guam Sta. Rpt. 1931–32, pp. 6, 7, 11–14*).—The progress of experiments with field crops (E.S.R., 66, p. 426), concluded on June 30, 1932, is reported for 1930–31 and 1931–32, and is summarized for the period 1909–32. The studies embraced variety tests with forage and lawngrasses, cowpeas, sweetpotatoes, yams, taro, dasheen, and yautia; cutting tests with forage grasses; planting experiments with lawngrasses; trellis tests with yams; fertilizer tests with corn; and a study of adaptation of maguey and henequen to different soil types. The station showed the superiority of certain introduced varieties of grasses, fiber plants, grain sorghum, rice, sweetpotatoes, and yautia in comparison with native varieties of these crops, and demonstrated the merits of improved cultural practices with corn and rice.

[Field crops and plant breeding research in New York], L. F. Randolph, P. H. Wessels, E. V. Hardenburg, O. Smith, and G. C. Moore (*[New York] Cornell Sta. Rpt. 1933, pp. 76, 78, 100, 101, 119, 120, 144–147*).—Brief progress reports are again given (E.S.R., 69, p. 38) on breeding work with wheat, oats, beans, and soybeans; genetic studies, observations on tetraploids, and the cytogenetic and heating effect of high frequency short radio waves, all with corn; potato experiments including fertilizer, cultural, and soil reaction studies, and the effects of fertilizer nutrients on yield, growth habit, and quality of tubers on muck soil; cultivation, spacing, and size of seed tests with field beans; pasture surveys and analyses of herbage; trials of grasses and legumes in mixtures for hay and pasture; and adaptation of wild white clover to different soil types.

[Field crops research in North Carolina, 1931–32], E. G. Moss, C. B. Williams, H. B. Mann, R. E. Currin, W. H. Rankin, C. E. Dearing, J. L. Rea, Jr., S. C. Clapp, J. W. Hendricks, J. H. Moore, J. A. Shanklin, R. T. Stutts, P. H. Kime, R. Schmidt, and M. E. Gardner (*North Carolina Sta. Rpt. 1932, pp. 20–26, 27–29, 31–33, 34, 35, 38, 40, 41, 43–45, 69, 72, 73*).—Agronomic research (E.S.R., 68, p. 468), reported on briefly from the station and branch stations, included variety tests with cotton for yield and wilt resistance, corn, wheat, oats, rye, barley, soybeans, alfalfa, red clover strains, peanuts, crotalaria, and tobacco; breeding work with cotton, wheat, potatoes, peanuts, and soybeans; inheritance studies with cotton; cultural (including planting) tests with cotton, corn, red clover, sweetpotatoes, and peanuts; intercropping of corn and soybeans; effects of certain dusts and sprays on growth and yield of peanuts; tobacco experiments concerned with fractional applications of fertilizers, quantities of magnesium, nitrogen sources, and the effects on yield and quality of crop rotation and of soybeans; fertilizer tests with cotton, involving soil types, nitrogen and phosphorus carriers, organic: inorganic nitrogen ratios, concentrated fertilizers and methods of applying them, and placement studies; cotton fiber studies dealing with source and care of seed, physical properties of improved varieties, and the effects of locality and fertilizer; utilization of crops grown in rotation with cotton; fertilizer needs of corn on different soil types; fertilizer mixtures for potatoes and sweetpotatoes; the yields and quality of different field crops when grown in variously fertilized and limed rotations on several soil types; and comparison of phosphorus sources for different crops in rotation. Certain phases of the research were in cooperation with the U.S. Department of Agriculture.

Root development of cotton, peanuts, and tobacco in central Oklahoma, W. E. BRUNER (*Okla. Acad. Sci. Proc. [Okla. Univ.], 12 (1932), pp. 20–37, figs. 9*).—The root development of Mebane cotton, peanuts, and tobacco grown in a fine sandy reddish brown loam soil in 1925 and 1926 is described and illustrated.

[Agronomic experiments in South Dakota], A. N. HUME (*South Dakota Sta. Rpt. 1933, pp. 11, 12–15*).—Research with field crops (E.S.R., 68, p. 754), reported on briefly from the station and substations, comprised a study of carbohydrate variations in corn; observations on the resistance to grasshoppers of corn varieties and of corn grown in alternate rows with sorghum; breeding work with spring wheat for rust resistance, winter wheat, barley, oats, and sorgo; inheritance of earliness and spring v. winter habit in wheat; a variety test with flax; crop rotations; and control of creeping Jennie by cultivation and chemicals.

[Experiments with field crops in Wyoming] (*Wyoming Sta. Rpt. 1933, pp. 4–6, 23, 24, 25, 26, 27, 28, 29, 31*).—Experiments (E.S.R., 68, p. 755) at the station and substations, for which progress is reported briefly, included variety tests with winter and spring wheat, oats, barley, corn, flax, potatoes, field peas, garden beans for seed, alfalfa, millet, and miscellaneous forage grasses and mixtures; cultural (including planting) experiments with winter and spring wheat, barley, oats, corn, and alfalfa; a seed selection test with field beans; a fertilizer trial with potatoes; response of sugar beets to superphosphate applications; effects of a shelter belt and manuring on crested wheatgrass; crop rotations and methods of preparing seed beds; pasture studies; and control of quackgrass by cultivation and chemicals. Certain lines of work were in cooperation with the U.S. Department of Agriculture.

Field crops on Berks shale soil respond to lime and fertilizers, P. T. GISH and T. B. HUTCHESON (*Virginia Sta. Bul. 292 (1933), pp. 29, figs. 5*).—Experiments with different field crops on Berks silt loam on the Augusta County Substation during the past decade comprised fertilizer and liming tests, comparisons of nitrogen and phosphorus carriers and cover crops, crop sequences, seeding tests, and variety trials.

Soils of this type, according to the results reported, should be used chiefly for pasture and production of small grains, clovers, alfalfa, and grass hays, but not for corn or other crops which make most of their growth in late summer. This soil responded well to lime; even well-fertilized areas did not make satisfactory crops without lime. A soil reaction of pH 6.5 to 7 was desirable for grains, red clover, alsike clover, and soybeans on this soil type, which calls for 1 to 1.5 tons of ground limestone per acre, or the equivalent, once during a 4- or 5-yr. rotation. Alfalfa and sweetclover do best with soil reaction between pH 7 and 7.25, which requires about 2 tons of ground limestone, or its equivalent, every 5 or 6 yr.

Sodium nitrate and ammonium sulfate were of equal value as nitrogen carriers where lime was used, but the nitrate gave somewhat better results where lime was omitted. Corn, small grains, and clover responded favorably to phosphates and potash, and where good crops of legumes were not obtained after rotations, nitrogen also paid. Potash appeared somewhat more important than phosphates for corn and clover, while for wheat, phosphates gave greater returns. Superphosphate was the most efficient phosphorus carrier on limed soils, and basic slag on unlimed soil. Corn and wheat yields were increased profitably by top dressings of quickly available nitrogenous fertilizers.

The Korean lespedeza proved satisfactory for pastures and soil improvement, but it was not dependable for hay in this section. It grew well on thin soils, yet it responded to phosphates, potash, and light applications of lime. Vetch and crimson clover were outstanding as winter cover crops for corn, while rye and other nonlegumes were unsatisfactory. Soybeans gave excellent results as a crop to precede wheat on inoculated soils and surpassed cowpeas for soil improvement and hay production. The best time for seeding these two legumes was from May 15 to June 1.

Crop varieties indicated as best for general use on the soil included Leaps Prolific, V.P.I. No. 131, and Forward wheat; Fulghum oats; Tennessee Winter and Virginia Hooded barley; Laredo and Otootan soybeans; Korean and Kobe lespedeza; and Grimm alfalfa where stands are to be maintained for 3 yr. or longer, or hardy common for stands of shorter duration.

The effect of nitrogenous fertilizers on the growth and yield of wheat and barley in South Australia.—Part I, Wheat grown after fallow and after stubble, A. E. V. Richardson and H. C. Gurney (*Empire Jour. Expt. Agr., 1 (1933), No. 3, pp. 193–205, figs. 3*).—Wheat on a well-worked bare fallow, in studies (E.S.R., 68, p. 184) at the Waite Agricultural Research Institute from 1928 to 1932, did not respond to ammonium sulfate during seasons [1928–31] in which rains before seeding were light, but returned significant increases in seasons with heavy rainfall before seeding. The response of fallowed soils to nitrogen was not enough to be profitable. When pre-seeding rains were light the mean nitrate-nitrogen content of the soil was found to be high, and vice versa. Wheat on land plowed from natural pasture or after a cereal made significant increases in yield over no-nitrogen controls. Little difference was found between the moisture content of fallow soil compared with stubble soil, but larger and more significant differences occurred in nitrate-nitrogen content. Benefits of fallowing seemed to lie more in promotion of nitrification and nitrate accumulation than in moisture conservation. In the comparison of nitrogen carriers sodium nitrate gave the largest increases, and ammonium sulfate, nitro-chalk, and urea gave similar increases which exceeded those due to diammonium phosphate. Drilling superphosphate or diammonium phosphate with the seed increased yields by 3.2 and 3.9 bu. per acre compared with surface broadcasting the fertilizer, while significant differences did not occur with ammonium sulfate.

Census studies on the growing crop showed that ammonium sulfate slightly depressed the stand, caused vigorous tillering with more spike-bearing tillers at harvest, increased spike length slightly, caused a weaker and sappier growth which lowered the percentage survival rate of tillers to form spikes, decreased the percentage of grain, and increased weed growth. The nitrogen naturally occurring on fallow caused a more prolonged and steadier tillering, resulting in sturdier tillers with a higher percentage survival rate.

A rapid method for making small grain hybrids, M. N. Pope (*Jour. Amer. Soc. Agron., 25 (1933), No. 11, pp. 771, 772*).—The method outlined was used successfully with barley and may succeed with wheat, rye, and rice.

Grassland management and its influence on the sward.—Part III, The management of a grassy sward and its effects, M. G. Jones (*Empire Jour. Expt. Agr., 1 (1933), No. 3, pp. 223–234, pls. 4*).—Experiments described in the third of this series (E.S.R., 70, p. 38) showed that by controlling the grazing animal extremely wide variations can be brought about in the botanical composition of the turf. In one study advantage was taken of the differential periods of active spring growth by the several components of the turf, perennial ryegrass being earliest, orchardgrass second, and wild white clover latest. Ryegrass was encouraged by resting the turf in early spring, which helped the species to gain strength during its critical period, this being followed by grazing at a later period critical for its principal competitor, orchardgrass. For the latter the grazing and resting periods were reversed in the spring. Again, the wild white clover was favored by checking its earlier and taller growing competitor. In a second experiment, both ryegrass and orchardgrass were strengthened more by protection from grazing in early autumn than in late autumn. Orchardgrass benefited more during the earlier resting period and ryegrass more in the later one. The influence of not returning animal droppings to the turf was shown in a much reduced yield of crop and a higher proportion of clovers. Wild white clover was most evident where grasses were least vigorous (late autumn rest), and Montgomery red clover was most favored by the early rest.

Pasture investigations, IV, V, B. A. Brown (*[Connecticut] Storrs Sta. Buls. 189 (1933), pp. 33, figs. 7; 190 (1933), pp. 15, figs. 2*).—Further contributions are made to the series (E.S.R., 70, p. 323).

IV. *Effect of fertilizers on the total and seasonal production.*—The effects of fertilizers on the total and seasonal production of the permanent pastures described earlier are reported for the period 1924–31. Measurement of production by controlled grazing with yearling steers and length of grazing seasons are discussed briefly.

Considering the gains of the steers on the untreated checks as 100, corresponding values for the periods 1924–28 and 1929–31 were for superphosphate 154 and 213, for superphosphate and limestone 227 and 309, and for minerals plus nitrogen 221 and 407. Based on feed units (therms) produced, respective values were for superphosphate 169 and 192, for superphosphate and limestone 208 and 265, and for minerals plus nitrogen 211 and 231. A second 500 lb. of superphosphate in 1929 resulted in an average increase of 13 percent over the plat where the second treatment was not given, whereas omitting the second ton of limestone in 1929 did not influence production through 1931. Basic slag was not so effective as superphosphate in increasing production. Potash had little or no influence on the production.

Valuing clover hay at $13.50 and silage at $4.50 per ton and at 1933 prices for fertilizers, the increased pasturage during 8 yr. from a dollar invested in superphosphate was estimated to be worth $8.50, in lime $3, in nitrogen at 28 lb. per acre $3.80, and at 56 lb. per acre and with lime $1.40. Increased soil fertility is also a considerable additional item in the case of superphosphate or lime.

During the period 1927–31, 68 percent of the thermal production was obtained before July 15. Fertilization has been of little consequence in equalizing the seasonal supply of pasturage. Applying one half the nitrogen in July rather than all in April reduced the total production 5 percent and increased the percentage of grazing after July 15 about 10 percent. The pasture receiving the most nitrogen in April required longer for recuperation after the zenith period. Data obtained in 1931 indicate that management is more important than fertilization in obtaining a better seasonal distribution of pasturage.

V. *A résumé of thirteen years of research.*—This summary of pasture research at the station considers the effects of fertilizers on total and seasonal production, changes in kinds of plants and chemical composition of the pasturage, soil reaction, reseeding, management, control of bushes, type of land, and acreage per animal on permanent pasture; indicates the merits of legumes, grasses, and mixtures for tilled, seeded pastures; and outlines several farm practices suggested by the pasture experiments.

Border effect studies of red clover and alfalfa, E. A. Hollowell and D. Heusinkveld (*Jour. Amer. Soc. Agron., 25 (1933), No. 12, pp. 779–789, figs. 2*).—Field plats comprising 8-, 12-, and 16-in. alleys with two, three, and four 4-in. rows, respectively, each 15 ft. long and adjacent to each side of the alley, were cut out of solid drill seedings of red clover and alfalfa in 1929, 1930, and 1931, in studies made by the U.S.D.A. Division of Forage Crops and Diseases, Bureau of Plant Industry, cooperating with the Ohio Experiment Station. Check plats consisted of seven consecutive rows. The plats were replicated 19 times and arranged systematically.

The border rows adjacent to 8-, 12-, and 16-in. alleys usually outyielded significantly the second and successive rows and check rows, and in several cases yields of the second rows from alleys also significantly exceeded those of succeeding rows and of check rows. In most tests, rows bordering on the north side of alleys outyielded those on the south side, these differences often being significant. With narrower alleys between plats came a corresponding decrease in yields of border rows.

When the results were applied to theoretical $\frac{1}{42.6}$ acre plats, inclusion of borders increased the yield from 2.1 to 20 percent for red clover, and from 1.8 to 14 percent for alfalfa. Border effect was greater on the second cutting than the first, and varied greatly from year to year. Rainfall appeared to be directly correlated with border effect. Under the experimental conditions inclusion of border rows in plat yields seemed to constitute so large an experimental error as to necessitate removal of border rows before plat yields are secured. The effect in different years and cuttings varies so widely that application of a correction factor would be of little value in reducing the error. Indications were that by discarding the two rows next to the alley, border effect can be eliminated as a source of error.

Ladino clover, B. A. Madson and J. E. Coke (*Calif. Agr. Col. Ext. Circ. 81 (1933), pp. 16, figs. 2*).—The characteristics and adaptations of Ladino clover (*Trifolium repens latum*), a promising plant for irrigated pasture, are described, and advice is given on cultural and field methods, including irrigation, management and grazing practices, pasture mixtures with desirable grasses, and seed production.

Chlorophyll content as an index of the productive capacity of selfed lines of corn and their hybrids, H. B. Sprague and N. Curtis (*Jour. Amer. Soc. Agron., 25 (1933), No. 11, pp. 709–724, figs. 2*).—The area of corn leaf blades, according to New Jersey Stations studies, can be determined as accurately by the formula length × greatest width × 0.75 as by planimeter readings of blueprinted leaf outlines, and without injury to leaves on growing plants. Both chlorophyll and carotin were most concentrated in the uppermost leaves and least in the bottom leaves, with a fairly regular gradient between them. Xanthopyll values were erratic. Estimates of total chlorophyll and of carotin for plants, based on pigment concentration in the middle leaf and on the leaf area determined by the formula, were practically as reliable as complete analyses of all leaves.

A group of 12 nearly homozygous selfed lines, selected on the basis of greenness of leaves in 1929, varied from 5.14 mg of chlorophyll per 100 cm² of leaf for the lightest strain to 11.3 mg for the darkest green strain when grown in 1930, and also differed widely in leaf area, total yield of dry matter, and shelled grain. From the chlorophyll content of 18 F_1 hybrids involving the 12 selfed lines and chosen to represent all combinations of greenness, it appeared that chlorophyll concentration of a given strain should either be genetically recessive; dominant, partly dominant, or cumulative in relation to that of other selfed lines. Mean values of attributes for parents of each hybrid suggested that chlorophyll inheritance is controlled by relatively few genetic factors in contrast with leaf area and yield. Significant correlations are indicated.

The mean values for chlorophyll concentration and total chlorophyll of selfed lines seemed to be partly reliable indexes of the total yield that will be produced by their hybrids. Indications were that light green inbreds with other desirable attributes should be mated with dark green rather than light green strains for best results. Selection of dark green plants in successive generations of segregating strains should aid in isolating prepotent lines.

Yield of maize in relation to espacement, W. R. Thompson (*Univ. Pretoria, ser. 1, No. 27 (1933), pp. 16+[14], [figs. 29]*).—The yields of grain, stover, and silage produced by two corn varieties grown for various periods in hills spaced from 6 to 36 in. apart in 3-ft. rows are shown graphically and are discussed.

The influence of soil productivity on the order of yield in a varietal trial of corn, C. A. Mooers (*Jour. Amer. Soc. Agron., 25 (1933), No. 12, pp. 796–800, figs. 2*).—Further studies on the relation of soil fertility to varietal behavior in corn (E.S.R., 46, p. 829) were made from 1921–32 on Memphis silt loam at the West Tennessee Substation with 4 varieties grown at rates of 3,000 to 6,600 plants per acre on unmanured land, and 4,200 to 7,800 on manured soil.

Average yields showed that on the unmanured section, Neal Paymaster, Jellicorse, and Jarvis Golden Prolific did best at the 3,000 rate and Hickory King at the 5,400 rate, but all yielded lowest at the 6,600 rate. On manured land, Neal Paymaster and Jellicorse yielded best at the 5,400 rate and Jarvis Golden Prolific and Hickory King at the 6,600 rate, and all but Jellicorse yielded lowest at the 4,200 rate. Indications were that up to 40 bu. per acre or a little more, Neal Paymaster is the heavier yielder, but that on land producing higher yields Jellicorse would be superior. Jarvis Golden Prolific in each set proved inferior to either Neal Paymaster or Jellicorse, but decidedly superior to Hickory King. Jarvis Golden Prolific might do no better than Hickory King, or even return inferior yields, on land producing 20 bu. or less per acre. The data suggested that a stand suited to each variety is necessary to a fair comparison, that results of a varietal trial of corn are primarily applicable only to soils similar to the soil in productivity, and that varietal trials on soils of both high and low productivity are required to show the scope of the adaptability and relative standing of different varieties.

The effect of fertilizers and rainfall on the length of cotton fiber, E. B. Reynolds and D. T. Killough (*Jour. Amer. Soc. Agron., 25 (1933), No. 11, pp. 756–764*).—Examination of the fibers of Mebane cotton grown in 1927–29 on variously fertilized or manured Lufkin fine sandy loam at the Texas Experiment Station did not reveal any significant correlation between the percentages of nitrogen, phosphoric acid, or potash, and the length of cotton fiber, although there was a slight tendency for potash to reduce it. On Kirvin fine sandy loam at Troup, Tex., in 1929, nitrogen and potash did not affect fiber length appreciably, although applications of phosphoric acid increased lint length somewhat. Significant increases or decreases in length of lint apparently produced by some of the fertilizers probably were not large enough to be detected in commercial classing. The length of fiber at the station was correlated positively with the amount of rainfall during boll development in 2 of the 3 yr., but no correlation was apparent between rainfall and length of fiber in 1929 at Troup.

Immaturity of cotton fibres in relation to the position of the seed in a lock and the length of fibres, R. Ayyar and R. L. N. Iyengar (*Indian Sci. Cong. Proc.* [*Calcutta*], *19* (*1932*), *pp. 77, 78*).—Factors influencing the production of immature cotton fiber were analyzed with particular attention to the position of the seed in the lock and fiber length, and using two strains of Cambodia and one of Karunganni cotton.

A definite relation was noted between length of fibers and the proportion of immature and ripe fibers, this relationship varying in direction with the type of cotton. Every increment in length did not produce equal increases or reductions in the percentage of ripe fibers. The distance from the pedicel end did not seem to bear any relation to the proportion of ripe and immature fibers, yet each seed in a lock acts as an independent distributing center and produces a definite influence on the production of immature and ripe fibers. Group lengths appeared to induce greater variation in the distribution of ripe fibers than position of the seeds, while it is the positions that contribute to the greater variability in the percentage of immature fibers in Cambodia cotton. A definite interaction between the position of the seed and the length of fibers seemed to influence the proportion of immature fibers borne on the seed.

Origin of lint and fuzz hairs, R. Ayyar and G. S. Iyengar (*Indian Sci. Cong. Proc.* [*Calcutta*], *19* (*1932*), *p. 77*).—Examination of microtome sections of cotton ovules of different ages revealed that formation of lint cells is predetermined and that differentiation in the epidermal cells occurs even 16 hr. before the flower opens. The rate of development of these cells varies with their location in the peripheral layer of the outer integument. Crops of hairs continue to be produced even after flowering. A second kind of hairs, evidently produced from the subepidermal layer 12 days after flowering, appears to correspond to the fuzz of the mature seed.

Variation in the physical properties of fibres situated in the different regions of the seed-surface, R. L. N. Iyengar (*Indian Sci. Cong. Proc.* [*Calcutta*], *19* (*1932*), *p. 78*).—Determination of length, weight per centimeter, and immaturity of fibers pulled from six regions of the surface of seeds of seed cotton showed the micropylar end contained fibers shorter than other portions, and has the greatest fiber weight and high percentages of ripe and few dead and thin-walled fibers. The chalazal end had a very low fiber weight and a high percentage of dead fibers. No great variations were noted in the other regions.

Kudzu vine (Pueraria thunbergiana), N. V. Joshi (*Agr. and Livestock in India*, *3* (*1933*), *No. 6*, *pp. 586–592*, *pls. 2*).—The germination, growth, nodulation, yield, green manure value, composition, and pasture value of kudzu are described from studies at Pusa.

The lespedezas in Ohio (*Ohio Sta. Bimo. Bul. 166* (*1934*), *pp. 14–18*).—The current status of the lespedezas in Ohio is described from results of continued cultural, hay production, and pasture experiments (E.S.R., 67, p. 239), especially with the annual Japanese (common), Korean, Kobe, and Tennessee No. 76, and the perennial *Lespedeza sericea*. The latter three varieties were not especially promising in the State.

Lespedezas as a group seemed somewhat better adapted than the common clovers to acid and thin soils, but suffered as much as clovers and more than alfalfa from drought. Since Ohio lies on the northern edge of the best environment for lespedezas, failures may be expected more often than farther south. Japanese and Korean lespedezas appeared to be promising for pastures in the southern third of the State. Korean may be used for hay in favorable seasons, either alone or in mixtures, and on soil too acid for good clover growth, and it may also produce pasture early in the fall. It showed considerable promise as a cover crop in orchards in southern Ohio. Growth of these lespedezas was considerably reduced by a good competing growth of grass or clover. Practices indicated include inoculation, buying only inspected-certified or guaranteed seed, sowing 10 to 20 lb. of Korean lespedeza on wheat in March or April, early seeding on permanent pasture, and a firm seed bed and shallow covering if sown with oats; for *L. sericea* in 2.5-ft. rows, 2 lb. of scarified seed after danger of heavy frost has passed, or 4 to 5 lb. of unscarified seed sown early, or from 20 to 25 lb. of seed broadcast solid and covered shallow.

The best practices in oats production, C. A. HELM (*Missouri Sta. Circ. 171* (*1934*), *p. 1, fig. 1*).—Productive practices are outlined for growing oats after corn and on lespedeza sod.

Culture and use of pop corn, J. R. DUNCAN (*Michigan Sta. Circ. 148* (*1934*), *pp. 15, figs. 7*).—A popular discussion of varieties, cultural methods, and field practices considered suitable for pop corn production in Michigan, marketing, seed selection, popping quality and expansion, and crispness. Tests made in 1930 and 1932 showed high positive correlations between popping expansion and crispness.

Irish potato culture in the Coastal Plain of Georgia, O. WOODARD (*Georgia Coastal Plain Sta. Bul. 20* (*1933*), *pp. 29*).—Productive practices indicated by the results of experiments with potatoes during the period 1922–32 included choice of a well-drained, loose, and slightly acid soil retentive of moisture; a crop rotation providing a liberal humus content and favoring insect and disease control; deep and early plowing, preferably in the fall; the Irish Cobbler, Red Bliss, and Green Mountain varieties, pure and disease-free; 12 to 15 bu. of seed per acre; seed disinfected with corrosive sublimate before cutting and immersed from 1 to 2 hr; 1-oz. sets; a fertilizer consisting of 6 to 8 percent phosphoric acid, 6 to 8 percent ammonia, and 8 to 10 percent potash, at the rate of 1,200 lb. per acre; a combination of organic and inorganic nitrogen carriers; spacings of 8 in. in the drill and 3 ft. in the row; planting between February 15 and March 15, slightly below a level on well-drained soils and covering from 2 to 3 in. deep; and cultivating often enough to prevent weed growth and to maintain a soil mulch, with slight ridging to facilitate harvesting. Effective control measures for insects and diseases attacking the crop are indicated, with recommendations for harvesting, containers, grading, packing, and marketing.

Tests show better ways to grow Michigan potatoes, J. J. BIRD and H. C. MOORE (*Michigan Sta. Spec. Bul. 245* (*1933*), *pp. 19, figs. 5*).—Fertilizer, spacing, and date-of-planting experiments with Russet Rural potatoes were made from 1927 to 1932 on 286 farms in the leading potato-growing sections of Michigan.

Application of 500 lb. per acre of 4–16–8 or 2–12–6 fertilizer increased yields by an average of 21 percent over unfertilized plats. The increase in yield due to fertilizer in seasons of extreme drought was about one half that in seasons of normal rainfall.

Potatoes in closely spaced hills (36 by 18 in.) outyielded those in wide spacing (36 by 36 in.) by an average of 35 bu. of U.S. No. 1 tubers per acre.

and were of better type and had less hollow heart. The increase in yield from close planting was not so marked in dry seasons. Potatoes from plats planted May 15 and 30 were of better market and culinary quality than those from plats planted June 15. The respective average acre yields of U.S. No. 1 tubers from the three planting dates were 126, 114, and 94 bu. The greatest increase from early planting was in 1932, when rainfall was about normal.

In variety trials in the Upper Peninsula practically no difference was found in yields from White Rural, Russet Rural, and Green Mountain. Green Mountain is recommended for counties of the Upper Peninsula with ample rainfall during the growing season. In tests in the Petoskey-Gaylord area, Russet Rural averaged 248 bu. per acre, White Rural 230, and Russet Burbank 150 bu. Russet Rural and White Rural are indicated for the Lower Peninsula.

[Rice in the Malay Peninsula] (*Malayan Agr. Jour., 21 (1933), No. 12, pp. 597–686, pls. 10*).—These pages comprise the following articles: Rice in Malaya in 1933, compiled by F. W. South (pp. 597–604); Padi Experiments in Malaya 1932–1933, by H. W. Jack (pp. 605–630); Padi Manuring Experiments 1932–33, by W. N. C. Belgrave (pp. 631–640); Pot Experiments with Padi, by J. H. Dennett (pp. 641–648); Irrigation and Drainage of Padi Areas, compiled by F. G. Finch (pp. 649–657); Irrigation Dams for Small Rivers, by B. O. Bush (pp. 658–663); Dry Padi in Kelantan, by J. A. Craig (pp. 664–666); Rice Milling in Malaya, by H. A. Tempany and H. W. Jack (pp. 667–673); The Characteristics of Malayan Milled Rice, by H. W. Jack and R. B. Jagoe (pp. 674–677); The Storage of Padi in Kedah, by W. N. Sands (pp. 678–681); and Malayan Padi Competition, by F. W. South (pp. 682–686).

Sorghum production in Kansas, H. H. LAUDE and A. F. SWANSON (*Kansas Sta. Bul. 265 (1933), pp. 47, figs. 18*).—Cultural methods and field and harvesting practices for growing grain sorghum, sorgo, and Sudan grass, variously for fodder, silage, or seed, and broomcorn for the brush, are recommended from the experiments and experience of the Kansas and other experiment stations and the U.S. Department of Agriculture, largely reported earlier. Information is given also on adapted varieties, prussic acid poisoning by sorghum, sorghum's place in crop rotations, and its injurious after-effects on the land, and on insects (by H. R. Bryson) and diseases attacking the crop.

The yield of sugar beets in relation to density of stand and plant food, O. W. WILLCOX (*Facts About Sugar, 28 (1933), No. 1, pp. 43–47, figs. 2*).—The application of the Mitscherlich effect law of growth factors to the determination of the limits of sugar beet yields is explained. See also an earlier note (E.S.R., 65, p. 526).

The effect of soil handling [for sugar beets] on the efficiency resulting from rate of fertilizer application, J. G. LILL and L. A. HURST (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 95–98*).—A comparison in 1932 of different methods of soil preparation, together with several acre-rates of fertilizer for sugar beets, related to the study noted earlier (E.S.R., 65, p. 433), gave results indicating a marked differential response of the crop to different soil preparation methods and quantities of fertilizer, and that these two factors tend to operate independently. Indications were that one factor would not compensate for the other, good soil preparation and proper fertilization both being essential. Practices suggested as economically sound were fall plowing, preferably reasonably deep, and from 200 to 300 lb. per acre of commercial fertilizer.

Sugar beet irrigation studies, H. E. BREWBAKER (*Facts About Sugar, 28 (1933), No. 2, pp. 93, 94, figs. 5*).—Results obtained in northern Colorado in 1931 by the U.S. Department of Agriculture cooperating with the Colorado

Experiment Station showed higher yields of sugar beet roots when the first irrigation was begun early than when it was delayed, the total seasonal supply being constant. An additional value was indicated for a late application. Irrigation every 15 days was preferable to double the length of run once every month. Conditions of soil moisture which approach the optimum for the entire growth of the plant seemed preferable to either delayed first irrigation or alternate dry and wet periods throughout the summer.

Testing cane to determine probable milling yield, G. Arceneaux, C. C. Krumbhaar, and R. B. Bisland (*Facts About Sugar, 28 (1933), No. 9, pp. 350–353*).—Mill tests with small quantities of sugarcane conducted at the U.S. Sugar Plant Field Station, Houma, La., furnished characteristic values for eight varieties, several of which were found to differ in some or all respects. Using P.O.J. 213 as the standard, the combined effect of differences in Brix and sucrose reduction factors and total juice extraction on the indicated yield of sugar per ton of cane for each of the other varieties was reduced to a single factor designated as the varietal correction factor. This factor was 0.98 for C.P. 807, C.P. 28/11, and C.P. 28/19; 1.00 (no correction) for P.O.J. 36–M, P.O.J. 213, P.O.J. 234, and Co. 281; and 1.06 for Co. 290.

The preservation of sugar cane seed, G. B. Sartoris (*Facts About Sugar, 26 (1931), No. 12, pp. 536, 550*).—Sugarcane seed preserved in calcium chloride and carbon dioxide at room temperature maintained viability for 8 mo. in tests by the U.S.D.A. Sugar Investigations, Bureau of Plant Industry. Seedlings from stored seed compared favorably in number with those secured from immediate germination of fresh seed.

The Queensland sugar industry, H. T. Easterby (*Brisbane: Queensland Bur. Sugar Expt. Stas., [1933], pp. XIII+226, pl. [1], [figs. 45]*).—This historical review features the development of the sugar industry in the State, mills and milling, labor and health problems, sugar prices, field machinery, and sugar experiment stations.

Distribution of the varieties and classes of wheat in the United States in 1929, J. A. Clark and K. S. Quisenberry (*U.S. Dept. Agr. Circ. 283 (1933), pp. 76, figs. 68*).—The distribution and acreages of classes and varieties of wheat are indicated from surveys in 1929, based on wheat-acreage data reported in the Fifteenth United States Census, and are compared with the distribution in 1919 and 1924 (E.S.R., 61, p. 638). Varietal maps show the distribution of the more important wheats. Estimated acreages and percentages of the total wheat acreage occupied by each variety or class in 1919, 1924, and 1929 are tabulated by States and for the United States.

In general a marked decrease occurred in the wheat acreage in the Eastern States and an increase in the Western States. The acreage of varieties in the hard red winter class increased markedly from 1919 to 1929, and the acreage of soft red winter wheats decreased. A moderate increase occurred in durum varieties and a slight decrease in hard red spring wheats. Although white wheat decreased from 1919 to 1924, it had regained its former acreage in 1929.

A comparison of wheat varieties in eastern Washington, O. E. Barbee (*Washington Sta. Bul. 289 (1933), pp. 44, figs. 6*).—Yields obtained since 1925 for wheat varieties reported previously (E.S.R., 55, p. 831) are tabulated and discussed, with the performance of new introductions, selections, and hybrids in nursery and plat tests at the station and in cooperative trials with farmers in wheat-producing counties. The varietal characteristics of winter and spring wheats grown at the station are set forth in a comparative table. Graphs show for groupings of winter and spring varieties the relationships of dates of maturity to yield and to weight per bushel, of lodging to height and to yield, and of yield to relative resistance to bunt.

Varieties currently recommended for eastern Washington are Turkey and Baart for the dry lands, Albit and Federation for areas with greater rainfall, and Triplet and Ridit for lands with intermediate rainfall, although the limits of these areas may shift with seasonal variations. Under certain conditions on limited areas, several other wheats because of peculiar adaptation proved equal or superior to recommended varieties.

Early ripening wheats and the advance of Italian wheat cultivation, N. Strampelli (*Roma: Tipog. Failli, 1933, pp.* [*16*], *pls.* [*22*]).—Brief remarks on wheat production in Italy, the development of new early wheats, their merits, food values, and yield increases due to their wide-spread culture are supplemented with distribution maps and colored plates illustrating the characters of the varieties, including the Ardito, Fausto Sestini, Mentana, Villa Glori, Edda, Balilla, Battisti, Filzi, Oberdan, Rismondo, Damiano, Fieramosca, Fanfulla, Mentana Mutico, and Aziziah 17-45 wheats.

The viability of seeds, J. H. Turner (*Roy. Bot. Gard., Kew, Bul. Misc. Inform., No. 6* (*1933*), *pp. 257-269*).—A résumé of research on the prolonged preservation of the viability of crop plant and weed seeds covers 39 titles.

Competitive efficiency of weeds and cereal crops, T. K. Pavlychenko and J. B. Harrington (*Canad. Jour., Res., 10* (*1934*), *No. 1, pp. 77-94, pls. 3, figs. 4*).—Study of possible indicators of the competing abilities of certain weeds and crop plants at the University of Saskatchewan showed that success in competition may depend on readiness and uniformity of germination under adverse moisture conditions, ability to develop a large assimilation surface in the early seedling stage, and possession of a large number of stomata and a root system with a large mass of fiber close to the surface, but with its main roots penetrating deeply. Cereals grouped in order of competing ability were barley, rye, wheat and oats, and flax. Wild mustard (*Brassica arvensis*) and wild oats (*Avena fatua*) were the most vigorous competitors among the weeds studied.

The absorption and movement of sodium chlorate when used as an herbicide, W. E. Loomis, E. V. Smith, R. Bissey, and L. E. Arnold (*Jour. Amer. Soc. Agron., 25* (*1933*), *No. 11, pp. 724-739, figs. 8*).—Sodium chlorate, in Iowa Experiment Station experiments, apparently penetrated readily all external surfaces of the plant except unusually heavy cuticle or corky layers, and might be expected to enter the plant whether applied to leaves, herbaceous stems, rhizomes, or to roots.

The movement of sodium chlorate within the plant seemed to be principally in the xylem and most rapid in the direction of the transpiration stream. With the higher transpiration rate of plants in moist soil and moderately dry atmosphere, a more rapid spread of chlorate throughout the plant occurred whether it was applied to part of the top or to the soil about the roots. Removing the phloem did not appreciably hinder the movement of the chlorate, but checking transpiration or holding the plants in humid atmosphere reduced it sharply. Sodium chlorate, whether applied to soil directly or reaching it in drip and leachings from sprayed plants, persisted in the soil apparently unchanged for 2½ yr., and it was particularly persistent when large quantities accumulated in an unleached subsoil. Sodium chlorate in the soil solution may be absorbed by the roots and rhizomes and translocated to the tops so that both tops and roots are killed. Removal of sodium chlorate from the soil by leaching appeared possible, but large volumes of water were needed, and indications were that decomposition of the salt is the principal cause of its disappearance. Decomposition was fairly rapid in moist soil above 20° C., but might be very slow in cool dry soil. This behavior can be used to advantage in assuring continued action on persistent weeds and in avoiding excessive accumulation of chlorates in soils in which decomposition is normally slow.

Contributions from the Wisley Laboratory.—LXX, Tests of sodium chlorate as a garden weed killer at Wisley, M. A. H. Tincker (*Jour. Roy. Hort. Soc., 59 (1934), No. 1, pp. 107–118*).—Various weeds, such as medow grass, dandelion, plantain, and mouse-ear chickweed, when growing in graveled paths were successfully controlled for a few months by applications of sodium chlorate, either as a dust or in solution. It was apparent that the chemical was gradually decomposed in the soil, lessening its toxic properties. Favorable results were also secured in freeing a neglected garden of weeds and in other trials with stinging nettles and also brambles (*Rubus fruticosus*). Early autumn, while the plants were still in leaf, proved a desirable time for treatment.

HORTICULTURE

What is next in horticultural research? R. D. Anthony (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 566–571*).—In this outlook on the future of horticultural research, the author discusses lines of activity that need greater study and urges greater cooperation of the horticulturist with the chemist, physiologist, and soil specialists.

[Horticulture at the Arizona Station] (*Arizona Sta. Rpt. 1933, pp. 15, 16, 20–24, 45–55, figs. 3*).—Brief reports are presented on the results of studies of the relation between soil composition and texture to the ripening season of grapefruit; the control of soil temperature in citrus orchards by mulching, cover crops, etc.; the processing of dates to enhance their quality and keeping; the growth and sugar changes in dates; the thinning of dates; the number of heat units required to mature different dates; absorption of moisture by dates during rain; the injury to dates from excessive moisture; the irrigation of lettuce seed beds; varietal and storage tests with cantaloups; cultural trials with strawberries; the relation of pollination to setting in the pecan; the control of pecan rosette; fertilizers for grapefruit; and light and moisture requirements of grapefruit and oranges.

[Horticulture at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 21 (1933), pp. 62–68, 69, 70, 72–88, 101–105, fig. 1*).—Herein are reported in considerable detail the results of fertilizer, cultural, and varietal trials with tomatoes, watermelons, lima beans, asparagus, and other vegetables. In addition information is presented on variety trials with apples, citrus fruits, peaches, plums, pecans, pears, grapes, jujubes, figs, and various bush fruits, and selection tests with blueberries. Varietal and fertilizer trials with vegetables, fruits, and flowers at the Coast Experiment Station at Darien are also included.

[Horticulture at the Guam Station], C. W. Edwards and J. Guerrero (*Guam Sta. Rpt. 1931–32, pp. 7, 8, 15–19, figs. 3*).—Following a review of the work of the station in the improvement of fruits and vegetables, brief accounts are given of results secured during the fiscal years 1930–31 and 1931–32. Included are studies on the control of scaly bark and gummosis of citrus trees, of introduced fruits and vegetables and forest trees, propagation of mangoes and avocados, and trial shipments of avocados to Manila and other ports.

[Horticulture at the New York State Station] (*New York State Sta. Rpt. 1933, pp. 41, 42, 43, 44, 72–80, 82–95*).—Among studies reviewed are those pertaining to the germination of lettuce seed; the processing of cannery peas; the carbon dioxide content of pea pods; the specific gravity of peas; changes in composition of strawberries during growth and ripening; the chemistry of factors promoting quality in apples, grapes, and raspberries; the origination of improved varieties of tree and small fruits; variety tests of tree and small fruits; grape improvement work at Fredonia; varietal and fertilizer work with tree and bush fruits in the Hudson River Valley; the pollination of tree fruits; chromosomal composition of various fruits; production of rootstocks for cherries, pears, and other tree fruits; the development of peach seeds; the artificial culture of cherry embryos; covering materials for full-planted tree seeds; varietal, cultural, and fertilizer experiments with canning crops, notably tomatoes, peas, sweet corn, and beans; correcting with limestone the pH of peat moss for packing nursery stock; indexes to maturity in cannery peas; mechanical harvesting of snap beans; and the effect of the growing season on the composition of squashes and pumpkins.

[Horticulture at the North Carolina Station], R. H. Rogers, C. F. Williams, M. E. Gardner, I. D. Jones, R. Schmidt, H. B. Mann, E. B. Morrow, G. O. Randall, and J. G. Weaver (*North Carolina Sta. Rpt. 1932, pp. 61–63, 64, 65–67, 68, 69, 75, 76*).—Brief reports are presented on studies in peach orchard management; peach tree fertilization; peach pruning; relation of leaf area to fruitfulness and growth of the peach; apple pruning; pecan cracking; yield of pecan varieties; soil management of pecan orchards; breeding of pecans; fertilization of the strawberry; fertilization and pruning of the dewberry; breeding of raspberries and dewberries; vegetable varieties; and varieties of ornamentals, particularly the tulip, rose, and dahlia.

The influence of rooting media on the character of roots produced by cuttings, J. C. Long (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 352–355, fig. 1*).—Of 43 kinds of cuttings placed in sand, peat moss, and a mixture thereof, 30 produced a more slender and more generally branched root system in the peat moss or the peat moss mixture than in sand. Studies with ivy, privet, and forsythia in which the pH and nutrient values of the sand and moss were changed showed no influence of soil reaction on the character of the roots. Where peat moss was kept at a low moisture content, approximately the optimum for sand, the roots approached in coarseness those in sand. Although peat moss at optimum moisture conditions for rooting contained twice as much air per volume unit as sand, the author considers it possible that less air may be actually available to the roots because of the close adherence of the peat particles, which makes possible the complete bathing of the root surface with moisture. As a result, aeration at the root surface in peat moss approximates that of sand only when the peat is extremely dry. A more clearly pronounced endodermis observed in roots from sand than from peat is believed related to the fewer secondary roots of sand-grown cuttings.

Is the increased rooting of wounded cuttings sometimes due to water absorption? L. H. Day (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 350, 351*).—Surmising that the unusual rapid development of California privet, quince, and Muscat grape cuttings wounded near the base in various ways might be due to their greater water intake, measurements were made at the University of California, Davis, upon the moisture absorption of Bartlett pear cuttings dried at room temperature to about 80 percent of their fresh weight and wounded in various ways before planting in moist sand. The wounded cuttings absorbed distinctly more water in the first 24 hours. Covering the wound with clay or fine limestone paste greatly increased water absorption. In the case of leafy cuttings taken in September those with clay-covered slits remained turgid, while the others wilted.

Vegetable breeding at the University of California, H. A. Jones (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 572–581*).—In connection with general notes on the vegetable-producing industry of California, the author presents a comprehensive survey of the olericultural program under way at the University of California.

[Vegetable growing at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 118, 119, 143, 144, 147–151*).—Among studies, the progress of which is discussed, are the breeding of cabbage for yield and uniformity; causes, nature, and prevention of premature flowering in the beet and onion, by E. Chroboczek and H. C. Thompson; the use of mulch paper in vegetable culture, by Thompson; the fertilization of onions, carrots, lettuce, and celery, the effect of copper compounds and other chemicals on the color and thickness of onion scales, and the pH requirements of onions, celery, carrots, and lettuce, all by J. E. Knott; chemical changes proceeding in carrots and squash in storage, and the handling of snap beans and peas in storage, by H. Platenius and F. S. Jamison; color development in vegetables as related to light, by O. Smith; and causes, nature, and prevention of blossom drop in tomato, eggplant, and pepper, by Smith, Thompson, and H. L. Cochran.

Prevention of frost injury to muck crops, P. M. HARMER (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 62–68, fig. 1*).—Commenting on the greater hazard from frost on muck soils than on mineral soils, the author discusses the following methods of preventing frost injury on such areas: Maintenance of a compact surface soil; maintenance of a high water-level; use of irrigation, of flooding, or of lakes adjacent to muck; improvement of air drainage on the field; addition of sand or clay to the surface; use of smudges and heaters; fertilization of crops; selection of crops not easily frozen; close and fairly early planting of frost-susceptible crops; and stirring of air by mechanical means. The wind movement resulting from the rotation of a large improvised fan carried up and down the alleys between plants increased by about 2° F. the air temperature close to the soil surface 30 ft. distant from the fan. An apparatus for drawing cold air upward from the soil surface is described.

Some experiments in asparagus cultivation, A. N. RAWES (*Jour. Roy. Hort. Soc., 59 (1934), No. 1, pp. 74–77, pls. 2*).—In studies in the Royal Horticultural Society trial grounds at Wisley staminate Conover Colossal asparagus plants in their second season in the permanent beds outyielded female plants receiving exactly the same treatment by a ratio of 3,238 to 2,092 salable stalks. Very little difference was observed in grade, but the male plants tended to give a proportionately greater number of good stalks in the early cuttings. In a comparison of different spacings for the Harwood Giant variety the maximum yield was secured with plants 3 by 1½ ft., suggesting that extremes in spacing are undesirable.

Bean investigations, J. C. MILLER and W. D. KIMBROUGH (*Louisiana Sta. Bul. 245 (1933), pp. 10*).—Fertilizer applied in moderate quantities, 200 to 400 lb. per acre of a 4–8–4 (NPK) mixture, was found effective in increasing the spring crop of Giant Stringless Greenpod beans. Larger applications, up to 1,200 lb., were noninjurious but failed to increase yields sufficiently to warrant their use. Fertilizers applied to fall-crop beans grown on a soil which had been spring fertilized and had grown a summer crop of soybeans for turning under proved of no value, and in fact nitrogen materials seemed to delay germination and reduce stand. Seed drilled in the row at 1-, 2-, 3-, 4-, and 5-in. spacings yielded 139.2, 124.8, 107.3, 96.3, and 84 bu. per acre, respectively, but the 2-in. spacing is recommended because of the lower cost of seed. Of 10 varieties, Currie Rust Proof wax was the most productive, but Burpee Stringless Greenpod and Bountiful are recommended for planting because of their earliness, productivity, and quality.

A comparative test of some cabbage varieties, A. E. Hutchins (*Minn. Hort., 62 (1934), No. 2, p. 36*).—Data presented by the Minnesota Experiment Station, largely in tabular form, show Marion Market to have been the most productive variety of early cabbage over the 3-year period 1931–33. However, on a basis of early maturity, during the 3 years Marion Market dropped to eighth place, Golden Acre taking first place by a rather wide margin over its nearest competitor, Viking Copenhagen. Among 8 varieties of late cabbage Bridgeport Drumhead led, with an average yield per acre of 33,686 lb. Premium Flat Dutch was a close second with a yield of 33,106 lb.

History and introduction of leading varieties of sweet corn, A. T. Erwin (*Seed World, 35 (1934), No. 4, pp. 13, 44*).—In this contribution from the Iowa Experiment Station information is presented on the origin of sweet corn in general and of the varieties Old Colony, Stowell Evergreen, Crosby, Country Gentleman, and Golden Bantam in particular.

The effect of ethyl alcohol on the ripening of tomatoes [trans. title], S. V. Soldatenkov and M. G. Kubli (Cubli) (*Dok. Akad. Nauk S.S.S.R. (Compt. Rend. Acad. Sci. U.R.S.S.), n. ser., 1 (1934), No. 2, pp. 85–90, figs. 3; Eng. abs., pp. 88–90*).—As reported by the Academy of Sciences, Leningrad, the injection with a hypodermic needle of 1 cc of ethyl alcohol into immature tomato fruits yet attached to the plant hastened ripening. In concentration of 96 percent the alcohol completely inhibited further enlargement of the tomatoes and in some cases caused abscission. Weaker concentrations were less harmful and at the same time less rapid in their effect on ripening. In 32 days after the injection of 48 percent alcohol all the fruits on treated plants had fully ripened, as compared with 45 percent on the control. The exposure of harvested tomatoes for brief periods to the vapors of alcohol accelerated ripening in a mild degree. Long periods of exposure to alcohol fumes actually delayed the coloring processes.

Freezing of greenhouse-grown tomatoes in transit, R. C. Wright and T. M. Whiteman (*U.S. Dept. Agr. Circ. 291 (1933), pp. 8, pl. 1, figs. 3*).—Accompanied by a colored plate depicting freezing injury in greenhouse tomatoes, this paper discusses the results of storage experiments with tomatoes held at various constant temperatures. Paper-wrapped tomatoes held at 17° F. for 24 hr. and then at 50° for 24 hr. were all injured with the exception of a few at the center of the top layer. At the same time no injury was manifest in a lot of fruit held at 30° for 24 hr. As determined by thermocouples placed within certain of the tomatoes, some individuals in the 17° chamber began freezing after 13.5 hr. following a period of undercooling to 25.5°. The actual freezing point varied from 30° to 30.5°.

In the second experiment part of a lot of tomatoes stored at 20° was jolted continuously to simulate conditions during transit. The first fruit in the jolted lot started to freeze after about 6 hr. as compared with 16 hr. in the undisturbed basket. The lowest undercooling points reached in the jolted and undisturbed lots were 27.7° and 23.2°, respectively. One fruit in the undisturbed basked remained undercooled without freezing throughout the entire 24 hr.

Northern Sweet watermelon—a new variety for northern gardens, T. M. Currence (*Minn. Hort., 62 (1934), No. 1, p. 13*).—A description is presented by the Minnesota Experiment Station of a watermelon obtained from Russian sources which combines earliness with quality and is deemed worthy of general trial.

[Pomology studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 129–134*).—Brief summaries are given of the results of pruning and transplanting studies with fruit trees; on soil management of young apple orchards; the adaptability of New York soils for fruit growing; the relationship between cultural treatment and damage from blight; fruit pollination; influence of spray materials on the activity of the leaf; the freezing storage of Montmorency cherries; and the development of red color in apples after harvesting.

The conduction of water in trees: Its relation to horticultural practice, R. B. Harvey (*Minn. Hort., 62 (1934), No. 1, p. 10*).—The author reports that when apple roots were cut off under water and placed in jars of colored water the liquid moved upward in the sector of the sapwood connected with the root. Sun scald is said to be caused by an excessively high temperature produced in the outer wood and cambium by the absorption of sunlight under conditions which prevent the dissipation of the heat produced. The temperature produced in plant tissue is related to the angle of the incidence of the sun's rays. The suggestion is made that in planting young trees sun scald may be avoided to a certain extent by so planting that one good conducting root is located in such a manner as to supply water to that area of the trunk most exposed to sunlight. The whitening of the exposed surfaces is also suggested.

Catalase activity in relation to the after-ripening of fruit tree seeds, I. C. Haut (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 375–379*).—Determinations were made at the University of Maryland of the catalase activity of embryos of McIntosh apple, Elberta peach, and mazzard and mahaleb cherries treated as follows immediately after harvest: (1) Placed in moist sand at room temperature, (2) held at a temperature of 1° to 2° C., and (3) dried at room temperature, soaked for 5 days, placed in moist sand, and allowed to afterripen at 1° to 2°. There were distinct increases in activity as afterripening progressed at the low temperature. Checking catalase readings with the results of germination tests, there was noted a fairly close correlation. There was no acceleration in catalase activity in the lot held at room temperature.

New Minnesota fruits, W. H. Alderman (*Minn. Hort., 62 (1934), No. 2, pp. 25, 28, fig. 1*).—Descriptive and historical notes are presented upon two new fruits, the Parker pear and the Flame crab apple, both developed at the University of Minnesota Fruit Breeding Farm.

[Fruit breeding at the South Dakota Station], N. E. Hansen (*South Dakota Sta. Rpt. 1933, pp. 27–30*).—Descriptions are presented of several seedling apples, crab apples, pears, sand cherries, and roses.

Trials of hardy fruits for commercial purposes (*Jour. Roy. Hort. Soc., 59 (1934), No. 1, pp. 82–96, pls. 6, figs. 6*).—Incident to a general discussion of results of variety trials with apples, raspberries, strawberries, and other fruits in the Royal Horticultural Society trial grounds, Wisley, information is presented on the comparative susceptibility of apple varieties to scab and the effect of spring frosts on crop yields.

Influence of the cion and of an intermediate stem-piece upon the character and development of roots of young apple trees, H. B. Tukey and K. D. Brase (*New York State Sta. Tech. Bul. 218 (1933), pp. 50, figs. 16; abs. in Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 379*).—A study of the root systems of trees developed from 1,800 French crab piece roots grafted to 14 varieties and clons of apples in 43 combinations of single and double working showed two major dominating factors, namely, the nature of the top scion and the compatibility of the union. Where the unions were smooth and congenial the top scion rather than the intermediate stem piece determined the shape and character of the root development. However, where the intermediate stem piece was from dwarfing stock it tended to dwarf the entire tree. The same result followed where the root piece or the top scion was of dwarfing stock.

Among correlations noted were a positive relation between the vigor of the top growth and the size of the root, a definite tendency in strong, vigorous growing trees for the roots to form broad angles with the main rootstock, and where Oldenburg was used as the top scion a tendency for the roots to become distinctly reddish in color whether or not an intermediate stem piece was interposed.

Observations on Cortland buds worked on French crab roots in three positions, namely, in the root of the rootstock, in the stem of the rootstock 2 in. above the ground level, and in the stem 6 in. above the ground, showed an effect of the top scion on root development in all three cases. In further trials with apples, pears, cherries, and roses there was observed no difference as a result of the height of the bud, except that very low buds were retarded in growth due to soil coverage and lower temperature. With roses, however, low budding was distinctly beneficial by protecting the bud during winter.

The exosmosis method of determining injury as applied to apple rootstock hardiness studies, C. F. Swingle (*Amer. Soc. Hort. Sci. Proc., 29* (*1932*), *pp. 380–383*).—Using a Hall-Adams radio-type conductivity outfit equipped with a platinum electrode, the author determined the conductivity of the liquid obtained after soaking pieces of rootstocks in water at 32° F. following exposure to temperatures close to or below the killing point. In general a complete agreement was obtained between the conductivity readings and the visual method of determining injury, in which roots are held for 7 days in sand at 60° after exposure. The author concludes that the exosmosis method deserves consideration as a useful tool in determining cold injury in horticultural material.

The effect of certain spray materials on the carbon dioxide assimilation by McIntosh apple leaves, M. B. Hoffman (*Amer. Soc. Hort. Sci. Proc., 29* (*1932*), *pp. 389–393*).—Spraying one of each pair of selected leaves on potted 1-year-old McIntosh trees, the author found in this study at Cornell University that lime-sulfur used at the regular summer strength reduced carbon dioxide intake by 37 percent. Records continued for 14 and 15 days showed the reducing effect to persist through this period without decrease. The apparatus used was described in an earlier paper (E.S.R., 70, p. 28).

The readings varied with the condition of the leaves; for example, it was noted that light green leaves removed less than half as much carbon dioxide from the air as did dark green leaves, and that sprays had appreciably greater reducing effects on the lighter leaves. No visible injury, such as leaf burning, accompanied reduced photosynthesis. Tests with Bordeaux mixture showed at times a reduction and at other times no reduction in carbon dioxide assimilation.

"Free" or seedling rootstocks in use for pears: Their description, selection, vegetative propagation, and preliminary testing, R. G. Hatton (*Jour. Pomol. and Hort. Sci., 11* (*1933*), *No. 4, pp. 305–334, pls. 6*).—Detailed records taken on collections of seedling pear stocks obtained from France, Luxembourg, and northern England indicated the presence of four more or less distinct types, which are described. From the total number there were selected for vegetative propagation 13 stocks. Budded with Dr. Jules Guyot, marked differences in amount and vigor of growth of trees on the different clons became apparent in one, two, and three years; in fact two of the rootstocks proved incompatible to the variety budded after one year.

Tested in the orchard as half standards and bush trees, the trees on clonal stock exhibited striking differences in vigor, some groups making twice the growth of others. Marked effects on the initiation of fruit bud formation were also observed, but early blossoming was not necessarily correlated with dwarfing.

Pollination of our orchard fruits.—I, Pollination of the pear [trans. title], H. Schanderl (*Züchter, 6 (1934), No. 1, pp. 6–12*).—A brief summary is presented of outstanding results of experimental work in Germany, Sweden, South Africa, and the United States, supplemented by practical recommendations for pear growers. Among suggestions offered are (1) that no variety, even those inclined to parthenocarpy, should be planted singly, (2) that one good pollen producer should be provided for every six or seven trees, and (3) that intersterile combinations, such as Williams Christbirne (Bartlett)×Gute Luise, should be avoided.

A note on the hardiness of buds of peach varieties, J. S. Shoemaker (*Ohio Sta. Bimo. Bul. 166 (1934), pp. 18–21*).—A minimum temperature of —10° F. in December 1932, an average for January 1933 of 10.4° above the mean of 44 years, and a minimum of —6° in February killed practically all Elberta fruit buds at Wooster, whereas many other varieties, including Carman, Heidelberg, Hope Farm, Lemon Free, Banner, Pioneer, New Prolific, South Haven, Champion, and Wooster came through with good crops. With respect to size of fruits, only three varieties, namely, Radiance, South Haven, and Veteran, produced a higher percentage of fruit 2.25 in. or above in diameter than did Carman. The author suggests that more thought be given to hardiness in the selection of peach varieties.

Cherry stocks at East Malling.—I, Stocks for Morello cherries, N. H. Grubb (*Jour. Pomol. and Hort. Sci., 11 (1933), No. 4, pp. 276–304, pls. 2*).—Of various lots of *Prunus avium*, *P. mahaleb*, and other cherry species employed in the trials, all were propagated vegetatively in some manner or other. In *P. avium* some lots rooted readily from layers, others moderately, and still others with difficulty. With mahaleb, layering, suckering, and root cuttings all gave poor success, but uniformly successful results were secured with softwood cuttings supplied with bottom heat. Certain indications were secured that satisfactory layering stocks of mahaleb might be selected from seedling populations. So-called acid cherries rooted poorly from layers but readily from softwood cuttings.

Clonal sweet cherry stocks were observed to produce measurable differences in Morello scions in growth, yield, and character of the fruit. The author believes that mahaleb and acid cherry stocks will also vary in their effect on the scion. As compared with sweet cherry, mahaleb-rooted trees were larger in their early years but later became weaker and more spreading. Trees on mahaleb were more susceptible to brown rot. Acid cherry stocks dwarfed the scion to a marked degree.

The identification of mazzard and mahaleb cherry stocks, T. E. Rawlins and K. H. Jarvis (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 383*).—Mazzard bark taken from below the graft union, washed, cut into thin splinters, and covered with water was found at the University of California to color the water yellow to orange within 2 to 5 minutes, whereas mahaleb bark under the same conditions had no coloring capacity. Morello bark behaved as did mazzard, but inasmuch as Morello is not widely used as a stock this similarity is not deemed important.

Pollination of sweet cherries [trans. title], F. Kobel and P. Steinegger (*Landw. Jahrb. Schweiz, 47 (1933), No. 9, pp. 973–1018, figs. 3; Fr. abs., p. 1017*).—In experiments at Wädenswil, Switzerland, involving approximately 148,000 blooms on 75 varieties of cherries, no variety was found worthy of the designation of self-fruitful. Six different intersterile combinations were observed among Swiss sweet cherries, and in addition the American cherry Bing proved intersterile with Napoleon types. A striking bud mutation, a red-fruited cherry on a limb of the black cherry Grosse Rotstieler, is described and pictured. The detailed behavior of each of the 75 varieties is discussed.

Fertilizer and tillage for blueberries, C. S. Beckwith and C. A. Doehlert (*New Jersey Stas. Bul. 558 (1933), pp. 8*).—Utilizing plats each containing 10 Rubel and 10 Rancocas blueberry plants, various fertilizers were applied at rates which would supply 33.6 lb. of actual nitrogen per acre. Yield records over a 3-year period showed the highest production on the nitrate of soda plat, followed closely by the standard cranberry fertilizer and a mixture of nitrate of soda and dried blood. It is indicated, however, that the complete fertilizer may possibly prove most valuable over a period of years. With regard to the time of application, the data indicate that spreading the application of nitrate of soda over 5 weeks was superior to one treatment, while with dried blood a single application proved best. The results of cultural experiments involving depth of tillage indicated that cultivation 2 to 4 in. deep was more desirable than shallower treatments, provided the implement was not brought too near the plants.

The Viking raspberry, R. E. Loree (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 99, 100, fig. 1*).—This new raspberry, originated at the Vineland, Ont., Horticultural Experiment Station from a cross between Cuthbert and Marlboro, has been found highly promising in Michigan. The plant and the fruit are described briefly.

The effect of fertilizers and grass mulch on the strawberry field, P. A. Rodrigo (*Philippine Jour. Agr., 4 (1933), No. 1, pp. 73–85, figs. 3*).—In studies in the Philippine Islands the mulching of strawberry beds with dry pine needles and dry grass proved beneficial, both with respect to the stand of plants and yield. The effect of both commercial fertilizer and stable manure was most pronounced on the unmulched areas, but the highest yields of all were secured from a combination of mulching and heavy fertilization.

Stimulation of grape bench grafts, H. E. Jacob (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 356–358*).—At the California Experiment Station, Davis, placement of stock cuttings in a warm room (75° to 85° F.) for 10 days prior to grafting greatly increased the percentage of vines obtained from the grafts. In two tests there were 65 and 20 percent of success in the warmed plats as compared with 2 percent in both controls. Benefit in most cases was obtained from immersing stock cuttings in water at 122° for various periods up to 25 min. Trials of manganese sulfate and of Semesan in various concentrations showed the latter to be of no value beyond the control of molds. The immersion of stock cuttings for 24 hr. in a 0.001 M manganese sulfate solution proved of moderate benefit, the odds by Student's method for several lots of Muscat and Emperor grafts being 73 to 1 in favor of the treatment.

Fruit bud studies.—II, The Sultana: Differentiation and development of the fruit buds, C. Barnard and J. E. Thomas (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 4, pp. 285–294*).—In this second contribution (E.S.R., 67, p. 395) upon studies at the Commonwealth Research Station, Merbein, Victoria, the authors summarize their results as follows:

"Tendril and inflorescence primordia differentiate from morphologically similar anlagen. The development of anlagen as inflorescence primordia or as tendril primordia is correlated with the time of the season during which the growth of the anlagen occurs. Differentiation of anlagen into inflorescence primordia takes place during late spring, summer, and autumn, while anlagen which are initiated after the winter rest become tendril primordia. Differentiation of an anlage into a primordium is defined as the acquisition of the mode of growth characteristic of the organ developed therefrom. Anlagen which are initiated in late summer or autumn and have not developed sufficiently before winter to acquire a definite habit of growth become tendril primordia during the following spring, while anlagen which had just begun to acquire the inflorescence mode of growth in autumn develop into 'transition' forms when growth recommences. Differentiation of the flowers of the inflorescence occurs as the buds are opening in spring and prohibits further ramification of the inflorescence."

Sprouting and grafting fractional parts of avocado embryos with attached cotyledonous material, H. P. Traub and E. C. Auchter (*Science, 78 (1933), No. 2026, pp. 389, 390*).—In this study, conducted by the U.S. Department of Agriculture, successful propagation of avocado embryos was obtained after splitting into two parts with cotyledonous material attached to each. Furthermore one-quarter embryos, secured by splitting the halves, sprouted and grew. A method of propagation in which scions were wedge grafted into fractional embryos with attached cotyledons is described. In this operation the scion actually replaced the developing plumule.

Preliminary observations on the storage of avocado pears, C. W. Wardlaw (*Trop. Agr. [Trinidad], 11 (1934), No. 2, pp. 27–35, pls. 2, figs. 5*).—Of 33 varieties of avocados studied with reference to behavior in cold storage, 22 were apparently unable to endure temperatures of 40° to 53° F. without developing internal discoloration. The remaining 11, on the other hand, ripened in good condition when placed at 70° after from 15 to 20 days at 40° or 45°. However, only 3 varieties were able to endure cool storage for 30 days without manifesting discoloration. Apparently the West Indian avocados are less resistant to low temperature than are the California types, such as employed by Overholser in his studies (E.S.R., 54, p. 41). Observations on the rate of cooling in packs showed a considerable lag between fruit flesh temperature and that of the surrounding air.

The correlation for daily rainfall and soil moisture with citrus yield and size of fruit, E. F. DeBusk (*Fla. State Hort. Soc. Proc., 46 (1933), pp. 44–47, pl. 1*).—Analyses by the University of Florida of weather and crop records extending over a period of years suggested an association between winter temperature and winter rainfall on the one hand and production on the other. Abundant rainfall and relatively low temperatures in the winter months forecasted an early and abundant bloom. On the other hand, a shortage of rainfall in this period was generally followed by irregular blossoming and a smaller crop of smaller sized fruits. Since size of fruits has such a marked influence on selling price, factors influencing size are necessarily highly significant.

Girdling Washington Navel orange trees, A. D. Shamel and C. S. Pomeroy (*Calif. Citrogr., 18 (1933), No. 12, pp. 328, 347, 348*).—For five consecutive years at the height of the flowering season Washington Navel trees growing in a commercial orchard at Corona, Calif., were girdled by drawing a sharp knife blade completely around the trunk. Yield records taken on these and adjacent ungirdled trees showed a slight increase in favor of girdling up to and including the third successive year, but girdling continued for four years or more apparently reduced yields. The sharp increases in production from girdling in years of light crops suggested that greater differences than those secured might have been recorded in a less productive orchard. No increase of disease or other tree disorders followed girdling.

Composition of juice of oranges from girdled and normal trees, C. G. Church (*Calif. Citrogr., 18 (1933), No. 12, pp. 348, 349*).—The girdling of

Washington Navel trees for 3 successive years increased slightly the soluble solids and the reducing sugars in the juice of the fruits. Samples collected after 5 yr. of girdling from 10 pairs of carefully selected trees showed the same tendency, the odds for soluble solids being 96:1 and for reducing sugars over 600:1. Blindfold tests of flavor failed to reveal conspicuous differences, suggesting that the effects of girdling on composition of fruit are so small as to merit no consideration in evaluating the operation.

Some problems in citrus products research, H. W. von Loesecke (*Fla. State Hort. Soc. Proc., 46 (1933), pp. 38–43, fig. 1*).—In studies at the U.S.D.A. Citrus Products Laboratory, Winter Haven, Fla., it was observed that after storage for 9 mo. at 40° F., properly deaerated, flash-pasteurized orange juice obtained from sound fruits possessed a taste and aroma not greatly different from that of fresh juice. However, when stored at 90° both orange and grapefruit juices packed in glass darkened, whether the caps were lacquered, tin, or aluminum. At 40° no darkening occurred, irrespective of the composition of the cap. Orange juice could not be successfully packed by exhausting, closing, and sterilizing in the same manner as grapefruit juice is successfully processed. The preparation of orange hearts, orange concentrates, orange oil, and lime juice is discussed.

The production of limes in Florida, A. F. Camp (*Fla. State Hort. Soc. Proc., 46 (1933), pp. 115–120*).—Data are presented on the present extent and possibilities of lime production in Florida, with information on the composition and cultural requirements of limes and lemons.

Experimental work in relation to pineapples, G. D. P. Olds (*Malayan Agr. Jour., 21 (1933), No. 10, pp. 492–504*).—Among results reported by the experiment station established in 1930 at Lim Chu Kang, some 17 miles from Singapore, are that complete commercial fertilizers proved superior to incomplete for the pineapple and that paper mulch was much more effective than tillage or mulching with pineapple refuse in increasing growth and yield. An appendix by J. H. Dennett is included.

Studies on the quick freezing of Philippine fruits and the utilization of the frozen pack products, F. T. Adriano, A. Valenzuela, and L. G. Miranda (*Philippine Jour. Agr., 4 (1933), No. 1, pp. 41–71, pls. 9*).—Among fruits utilized in these studies were strawberries, mangoes, avocados, lanzones, ates, guavas, coconuts, pineapples, nangkas, lemasas, chicos, and zapotes. In general a temperature of 0° F. or —40° yielded better flavored, better colored, and better textured products than did 18°. The combination of airtight containers and a sirup of 40° to 60° Brix, depending on the species preserved, promoted a desirable pack. The utilization of frozen fruits is discussed.

U.S. Department of Agriculture pecan research in Texas, C. L. Smith (*Tex. Pecan Growers Assoc. Proc., 12 (1932), pp. 43–47*).—Determinations of starch in the roots of young pecan trees cut back sharply for grafting purposes showed a rapid decline following the heading back as compared with unpruned control trees. The severer the heading the smaller was the amount of starch present.

Effect of storage conditions on the germination of seed pecans, C. L. Smith, C. J. B. Thor, and L. D. Romberg (*Tex. Pecan Growers Assoc. Proc., 13 (1933), pp. 68–71*).—Burkett and Stuart nuts held over one season in cloth bags at a temperature ranging from 0° to 5° C. showed good viability, whereas no germination was secured from comparable nuts held at room temperature. On the other hand fresh nuts kept less than 4 mo. (October 18 to February 1) in a warm room germinated satisfactorily. The cold-stored nuts were slower in germinating than the others.

Pollination control, period of receptivity, and pollen viability in the pecan, C. L. Smith and L. D. Romberg (*Tex. Pecan Growers Assoc. Proc., 12 (1932), pp. 23–34*).—Studies conducted by the U.S. Department of Agriculture in a commercial orchard at Denison, Tex., indicated that in controlled pollination cellophane bags are superior to paraffined cloth sacks because of lighter weight, greater transparency. and less resistance to the diffusion of moisture. Burkett, Schley, Success, and Texas Prolific pistillate blooms remained receptive for 18, 20, 24, and 28 days, respectively, in 1932. Schley pollen remained effective for 8 days after collection. No evidence was secured that the period of receptivity was lengthened by the relative high humidity and decreased light prevailing in the paraffined sack.

Further studies on periods of receptivity and pollen viability in the pecan, C. L. Smith and L. D. Romberg (*Tex. Pecan Growers Assoc. Proc., 13 (1933), pp. 76–85*).—Observations at Austin and Denison, Tex., upon the receptive periods of several varieties of pecans showed approximately the same behavior at both locations. Burkett, Schley, Success, and Texas Prolific pistillate flowers were receptive for 12, 14, 14, and 20 days, respectively, at Denison. The periods of maximum receptivity of the pistillate flowers did not coincide with the period of maximum pollen shedding in any variety, and in most cases no considerable pollen was shed while the flowers were receptive, thus suggesting the need of varietal interplanting. Texas Prolific, Success, and Schley pollens remained effective for 12, 11, and 10 days, respectively.

The variation of seedlings from selected pecan trees, H. P. Traub and O. S. Gray (*Tex. Pecan Growers Assoc. Proc., 11 (1931), pp. 23–25*).—Studies of 68 2-year-old seedling pecan progenies resulting from the open pollination of individual trees showed a wide range, 12 to 88 percent, in the percentage of variation from the average trunk diameter and also for total height, 6 to 56 percent. As a rule, the percentage variation in trunk diameter for any one progeny was lower than for total height. There was some indication that total height declined as the variability of the progeny increased.

A physiological study of fruit development in the pecan (Hicoria pecan), C. L. Smith and C. J. B. Thor (*Tex. Pecan Growers Assoc. Proc., 13 (1933), pp. 71–76*).—Studies of nuts collected near Austin, Tex., at intervals from May 18 to November 14 showed two distinct stages of development, the first embracing the shuck and shell enlargement lasting until early September and the second the development of the kernel. Most of the oil, protein, mineral, and acid-hydrolyzable polysaccharides of the kernel were formed during September, whereas the sugar appeared during the first half of October. The author suggests that much of the sugar may have been obtained by translocation from the shuck. The critical period in kernel development is believed to occur in September.

[Ornamental horticulture at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 115, 116*).—Brief mention is made of the results of studies on the fertilization and pruning of shade trees in the lawn, by D. Wyman; on the use of electrically heated hotbeds for rooting evergreen cuttings, by Wyman and H. T. Skinner; the effect of nitrogen concentration of the soil on growth, production, and stem length of sweet peas, and the effect of the abbreviation of the day length of chrysanthemum flowering, both by K. Post; modification of flower color in the hydrangea, by R. C. Allen; and the effect of low temperature on the keeping of cut flowers, by A. M. S. Pridham.

The production of summer cut flowers under cloth, K. Post (*Amer. Soc. Hort. Sci. Proc., 29 (1932), p. 549*).—Shading with reinforced cheesecloth having a thread count of 22 by 22 was found at Cornell University to increase the length of stem and size of flower on all varieties of ornamentals tested. Asters, chrysanthemums, snapdragons, calendulas, sweet peas, dahlias, hunnemanias, and pentstemons were benefited the most. Insect injury was decreased, and fungus pests were no more troublesome under the cloth.

Propagation of hybrid amaryllis (Hippeastrum) by cuttage, H. P. Traub (*Science, 78 (1933), No. 2032, p. 532*).—A rapid increase of hybrid amaryllis was secured by the U.S. Department of Agriculture by partially quartering blooming size bulbs and placing them in clay pots containing sand or loam. Where the bulbs were completely severed into quarters root formation apparently was retarded to some extent. Sand gave rise to disease-free plants, whereas those in loam showed some red rust.

Studies of the growth of annuals and pompon chrysanthemums under cloth enclosures, A. Laurie (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 550–554*).—Tests at Ohio State University showed favorable results with various annuals and perennials from cloth shading. Temperatures were from 1° to 3° F. higher under the cloth, and light intensity was reduced according to the color of the cloth. Soil moisture and relative humidity of the air were higher in the enclosure. In the case of pompons, covering with black cloth materially hastened flowering.

Photoperiodism and chrysanthemum production, E. J. Starkey (*Science, 76 (1932), No. 1982, pp. 594, 595*).—As reported by the Colorado Experiment Station, the shading with black cloth of two commercial chrysanthemum houses near Denver greatly hastened blooming.

Vegetative propagation in Cotoneaster, W. A. Clark (*Bot. Soc. Edinb., Trans. and Proc., 31 (1932–33), pt. 2, pp. 256–261, pls. 2*).—Preformed root initials observed in *C. microphylla* as slight protuberances above the emergence of the bud were found to originate as a group of cells in the bud gap. Finding a continuity between the vascular cambium of the stem and the apical meristem of the root initial, the author suggests that the root initial may have been produced from the stem cambium. In propagating, roots were produced by a resumption of growth of the preformed root initials. Cuttings placed in the bed in March rooted more successfully than those inserted earlier. A negative correlation was observed between callusing and rooting.

Fuchsias, E. O. Essig (*Natl. Hort. Mag., 13 (1934), No. 1, pp. 1–59, figs. 47*).—Preceded by a brief account of the horticultural history of the genus, descriptions are presented of numerous species and varieties growing in the author's garden at Berkeley, Calif.

A survey of lily soils, A. D. Hall and M. A. H. Tincker (In *Lily Year-Book, 1933. London: Roy. Hort. Soc., 1933, Conf. No., pp. 58–77, pls. 2*).—In an attempt to determine the soil requirements of various lilies, samples of soil obtained from beds where lilies were or were not thriving were tested at the Wisley Laboratory, England, for acidity, presence of carbonate of lime, moisture content when air-dried, and organic matter.

The lilies were found unexpectedly tolerant of wide variations in acidity and in lime content of the soil. Abundant organic matter appeared to exert a buffering effect on strongly acid soils. Mycorrhiza were not found on any of the lily roots, thus dismissing them as a factor. The water supply as conditioned by drainage and humus content of the soil at various depths is believed to be an important consideration in the welfare of lilies.

Vegetative propagation of the lily, D. Griffiths (In *Lily Year-Book, 1933. London: Roy. Hort. Soc., 1933, Conf. No., pp. 104–118, figs. 15*).—The various methods of asexual reproduction in the lily, namely, bulbils, splits, stem cuttings, stem bulblets, and scales, are discussed, with notes on the behavior of important species. The artificial propagation of Madonna and other lily scales in warm chambers is described.

Propagation of lilies by seed, F. C. Stern (In *Lily Year-Book, 1933. London: Roy. Hort. Soc., 1933, Conf. No., pp. 119–129, figs. 2*).—Stating that seed propagation of the lily offers the advantage of freedom from disease in the new generation, the author discusses the germination and development and methods of planting and handling lily seedlings.

Sterilities in lilies (Lilium), A. B. Stout (In *Lily Year-Book, 1933. London: Roy. Hort. Soc., 1933, Conf. No., pp. 142–171, figs. 8*).—This is a discussion, based largely on investigations at the New York Botanical Garden, upon the occurrence, nature, and causes of self- and cross-sterility in the lily. No evidence was seen that the vegetative habit or asexual propagation so frequent in lilies has any direct causal effect on the development of sterility.

Hybridization of lilies, I. Preston (In *Lily Year-Book, 1933. London: Roy. Hort. Soc., 1933, Conf. No., pp. 172–193, figs. 7*).—An account is presented of the author's lily breeding activities at the Ontario Agricultural College, Guelph, and the Central Experimental Farm, Ottawa, Canada, with notes on the technic employed and on promising seedlings secured.

Effects of day length on growth of orchid seedlings, J. C. Ratsek (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 555–557*).—At Cornell University additional light from Mazda lamps supplied orchid seedlings growing in tubes on nutrient media increased the fresh weight of the seedlings, particularly during the winter period. Additional light increased also the height of the seedlings and the growth of the apical bud and induced the development of long, thin roots as compared with the short, thick roots of the short-day plants. The differences in effect of 25- and 60-w lamps were immaterial.

Peonies, F. F. Rockwell (*New York: Macmillan Co., 1933, pp. XI+73, pls. 5, figs. 12*).—A compilation of useful information regarding varieties and culture.

Seedling production of tree peony, L. V. Barton (*Contrib. Boyce Thompson Inst., 5 (1933), No. 4, pp. 451–460, figs. 4*).—Although satisfactory germination of tree peony seed was obtained at a daily alternating temperature of from 15° to 30° C., the resulting seedlings failed to continue development and the roots died. However, when small seedlings were potted and held at 5° to 10° for from 2 to 3 mo. good shoot production followed their transfer to a cool greenhouse maintained at about 13°. Good success followed the planting of seeds in flats in May, June, or July and storing them in board-covered coldframes. However, when planted during autumn or winter seedling production was poor.

Freezing injury to arborvitae and junipers in Kansas, L. E. Melchers (*Amer. Jour. Bot., 20 (1933), No. 9, pp. 593–595*).—Observations by the Kansas Experiment Station following exceptionally low temperatures in March 1932, succeeding a mild February, showed unusual injury to many conifers which ordinarily endure Kansas winters with little harm. Among species very severely injured were Baker, Goldspire, and Bluegreen arborvitae, Spiny Greek juniper, and Japanese red pine. There was some indication that arborvitae with golden or yellow foliage suffered less than did the green types.

Growth responses of pin oaks due to fertilizers, pruning, and soil conditions, D. Wyman (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 562–565*).—Further evidence (E.S.R., 68, p. 198) is presented on the benefit of careful planting of spring-set oak trees. On gravelly soils the spring-planted trees made greater growth than fall-planted, not only in the first but also in the second season. Nitrogen fertilizers applied in relatively small quantities proved beneficial, resulting in growth significantly greater than that of the unfertilized trees. Severe pruning of newly planted trees resulted in a material reduction in growth.

The Wright encyclopaedia of gardening, W. P. Wright (*London: J. M. Dent & Sons, 1933, pp. XVII+614, pl. 1, figs. 344*).—Arranged on an alphabetical basis, concise information is presented on garden operation.

Landscape gardening, R. Sudell (*London and Melbourne: Ward, Lock & Co., 1933, pp. 480, pls. 8, figs. 317*).—A general discussion dealing with planning, construction, and planting of estates and gardens.

FORESTRY

A national plan for American forestry (*U.S. Senate, 73. Cong., 1. Sess., Doc. 12 (1933), vols. 1, pp. X+1050, figs. 119; 2, pp. III+1051–1677, figs. 19*).—This comprehensive report upon the forest situation and problems in the United States was prepared by the U.S.D.A. Forest Service pursuant to Senate Resolution 175. The principal recommendations are (1) a large extension of public ownership of forest lands, and (2) more intensive management on all publicly owned lands.

[Forestry at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 80, 81, 116–118*).—Included are brief reports of progress of studies of the nature and properties of the forest humus layer; forest types in the Adirondack region; and the physiology of dormancy in basswood seeds, the effect of moist cold storage on the afterripening and germination of forest tree seeds, and methods of killing trees to prevent the reproduction of suckers and sprouts, all by J. N. Spaeth.

Is there a natural crop rotation in forests? H. I. Baldwin (*Ecology, 15 (1934), No. 1, pp. 67, 68*).—Stating that reproduction in the forest often consists of species other than the existing dominants, the author analyzes the possible causes of such change, namely, relative differences in efficiency of seed production, different tolerance requirements, and the increasing moisture in the surface soil, and reaches the conclusion that until controlled experiments have proved otherwise it is best to explain all cases of crop rotation by the natural laws of succession operating in each forest association.

Evidence of the rate of forest succession on Star Island, Minnesota, J. Kittredge, Jr. (*Ecology, 15 (1934), No. 1, pp. 24–35*).—Protected from fire by the surrounding waters of Cass Lake, the 1,200-acre area comprising Star Island afforded an exceptional opportunity for the U.S.D.A. Lake States Forest Experiment Station to study forest succession. Excellent examples were present of four successive stages of transition, (1) jack pine, (2) Norway pine, (3) white pine, and (4) sugar maple-basswood, the last presumably representing the climax forest. Apparently the minimum periods for the jack, Norway, and white pine stages are 100, 300, and 250 yr., respectively. The subordinate vegetation exhibits changes in floristic composition and cover corresponding to the stages of forest succession, but with few species exclusively typical of any one stage.

The relation of certain soil characteristics to forest growth and composition in the northern hardwood forest of northern Michigan, R. H. Westveld (*Michigan Sta. Tech. Bul. 135 (1933), pp. 52, figs. 7*).—Selected ¼-acre plats located in areas of distinct soil type were studied with respect to the composition and uniformity of the stand in relation to the soil. There was observed a relatively wide range in the texture of the soils supporting a natural deciduous forest growth. Of the 23 soils under study, 7 groups were distinguished on the basis of similarities, and with respect to quality 3 site indexes, 70, 80, and 90 ft. at maturity, were determined.

The composition of the stands influenced yields directly; for example, American elm or basswood increased, beech decreased, and yellow birch had no appreciable effect on yield. Site index was found closely related to certain major characteristics of the soil profile, such as depth and nature of the top soil and of the subsoil. Of the 20 tree species considered in the study, only 9, namely, sugar maple, beech, yellow birch, American elm, basswood, hemlock, balsam fir, ironwood, and red maple, were well represented on practically all of the soils. White pine was apparently widely distributed prior to logging. Sugar maple, except when in direct competition with beech, was most abundant on loams, sandy loams, and loamy sands with a yellow sand substratum 15 to 30 in. below the surface. Beech was confined to the eastern half of the peninsula. Yellow birch and American elm were present on all of the soil types. Basswood was confined largely to the heavier loams, and hemlock, although not abundant, was most prevalent in cool, moist situations.

In concluding the author asserts that the relationships between soil characteristics and growth were sufficiently conclusive to establish general principles for forest land classification and silvicultural practices.

Observations on drought injury in Minnesota forests, H. L. SHIRLEY (*Ecology, 15 (1934), No. 1, pp. 42–48*).—Observations by the U.S.D.A. Lake States Forest Experiment Station upon the injuries occurring in Minnesota swamp and pine forests following the disastrous drought of 1930 showed no loss of older trees in the swamps but a large mortality of black spruce seedlings rooted only in the upper layers of moss. Losses in the pine forest decreased in severity with increasing height and density of reproduction and with increasing density of brush cover and upper canopies. Apparently the increased root competition of older trees was more than offset by the benefit of their shade.

Yield of the oak-chestnut-hard pine forest type in Pennsylvania, J. E. AUGHANBAUGH (*Jour. Forestry, 32 (1934), No. 1, pp. 80–89*).—Measurements in sample plats established in the oak-chestnut-hard pine association, conservatively estimated to comprise one half of the 13,000,000 acres of forest land in Pennsylvania, showed that the greater portion of height development in this type is made during the first 60 years. Up to this time the dominant trees maintained an annual increase of 1 ft. or more per year. Mean annual growth in cubic feet was highest during the first 40 years, when the average approximated 0.7 cord per acre per year. Board-foot production commenced at about 40 years and reached the peak of 130 bd. ft. per year at 100 years.

Comparison of Pennsylvania records with those taken in Connecticut, Vermont, and Illinois showed comparable rates of growth in the several regions.

An anatomical explanation of the Northwest coniferous climax forests, A. F. HEMENWAY (*Science, 78 (1933), No. 2028, p. 437*).—Tissue analyses made at the University of Arizona upon material collected throughout the year from various conifers and deciduous trees of Oregon and Kentucky indicated that Oregon conifers grow throughout the winter, whereas in Kentucky both conifers and broadleaf species were inactive during this season. Oregon deciduous species apparently did not grow in winter, affording an explanation of the dominance of conifers in the Oregon forest.

Cypress buttresses and knees in relation to water and air, H. KURZ and D. DEMAREE (*Ecology, 15 (1934), No. 1, pp. 36–41, figs. 7*).—Studies of various types of cypress buttresses and of their environment indicated that the form of any particular buttress depended on the frequency as well as the duration with which its various horizons are subjected at once to water and air. Cypress knees like the buttresses are considered reactions to water plus air exposure.

Further notes on the germination of hemlock seed, H. I. Baldwin (*Jour. Forestry, 32 (1934), No. 1, pp. 99, 100*).—Following an earlier paper (E.S.R., 64, p. 344) on the benefits of afterripening of hemlock seed, the author carried on further tests which revealed occasional lots of seed which failed to respond to afterripening treatment. Moisture absorption and catalase activity proceeded in the slow seeds much as in the normal, and variation in germination temperature and germination media produced little effect. The author believes that differences in the treatment of the seed during harvesting, extraction, and storage may be responsible in part for the erratic behavior.

Notes on black locust pod collection, seed extraction, and seed cleaning, C. F. Olsen (*Jour. Forestry, 32 (1934), No. 1, pp. 97, 98*).—Tests conducted at Holly Springs, Miss., by the U.S.D.A. Southern Forest Experiment Station showed that 3.62 lb. of locust pods were required to yield 1 lb. of seed, the cost of which, including the various operations, approximated 31 ct.

A twenty year record of changes in an Arizona pine forest, G. A. Pearson (*Ecology, 14 (1933), No. 3, pp. 272–285, figs. 6*).—Data secured in 1929 on plants established in 1909 in the Tusayan National Forest, Ariz., just following logging operations which removed two thirds of the merchantable volume, showed a net annual increment per acre during the 20 yr. of 2.59 percent of the 1909 volume. The author suggests that this increment would permit in 60 yr. from the time of the original cutting a yield equal to that of 1909 without a reduction in the growing stock. During the 20 yr. 10.2 percent of the trees over 4 in. left after the initial logging died, representing an annual loss of 20 bd.-ft. per acre. Overgrazing during the first decade inhibited reproduction, except on two fenced plats of 12 acres each.

Virginia pine in Pennsylvania, A. C. McIntyre (*Pennsylvania Sta. Bul. 300 (1933), pp. 31, figs. 13*).—Virginia pine, a short-lived species normally of minor importance in the permanent forests of Pennsylvania, has proved of great value in natural reforestation of abandoned farm lands. In most sections of the State, Virginia pine and its associates, pitch, mountain, and white pines, are temporary, giving way to longer-lived and more tolerant species, in most cases changing to an oak forest. However, by selective cutting or cutting to a diameter limit Virginia pine was maintained for a considerable time on any site where clear cutting would simply encourage hardwoods. Stands of Virginia pine are said to be usually extremely irregular, but with advancing age become more uniform, due to the partial suppression of the larger trees by their neighbors.

Yield, stand, volume, and cordwood tables presented for Virginia pine show the species to reach a maximum mean annual growth rate at about 52 yr. for cordwood and 68 yr. for saw timber. The greatest mean annual growth rate for total cubic-foot volume occurs at about 20 yr.

Increase in growth of loblolly pines left after partial cutting, A. L. MacKinney (*Jour. Agr. Res. [U.S.], 47 (1933), No. 10, pp. 807–821, figs. 7*).—Computations from data taken during 1927 and 1928 in nine Atlantic Coastal Plain loblolly pine stands, which had been partially cut some 10 yr. earlier and not burned over in the interim, indicated that the basal-area growth at breast height was on the average 130 percent greater than would have been attained by the same trees if unreleased. In descending order crown ratio, crown width, basal area, total height at the time of release, and basal-area growth during the 5 yr. prior to release were found to be correlated with the increase in basal-area growth after release.

No satisfactory method was found for measuring the effects of different degrees of release on the growth of trees of the same characteristics. Mechanisms developed for predicting the size of individual trees 10 yr. after release are said to be theoretically applicable only to trees growing under the same general conditions as the trees included in the sample and to stands cut in approximately the same way as those sampled. Most of the loblolly stands being cut in the area are similar in age, in density of stocking, and in quality to the stands in which the trees were growing prior to release.

Logging damage in selectively logged loblolly pine stands, A. L. MacKinney (*Jour. Forestry, 32 (1934), No. 1, pp. 94–96*).—Records taken by the U.S.D.A. Appalachian Forest Experiment Station in connection with two selective logging studies in loblolly stands, one a forest-grown stand in Virginia and the other an old-field stand in North Carolina, showed that the average number of loblolly pines per acre damaged beyond recovery was relatively small in both areas. Hardwoods, on the other hand, were severely damaged, a result believed due in part to a greater effort to save the residual pines.

Post-logging decadence in northern hardwoods, R. C. Hall (*Mich. Univ., School Forestry and Conserv. Bul. 3 (1933), pp. 66, figs. 27*).—Originally undertaken to determine the role of the bronze birch borer in post-logging decadence, this study, conducted in New England and in the Lake States region, indicated that the borer is not, as originally suspected, the primary cause of such decadence but should be relegated to the group of secondary insects. The severity of injury following logging is believed to depend directly on the character of the forest and the intensity of the cut. The nearer logging approaches clear cutting the greater will be the post-logging decadence. Appended are the methods employed in analyzing data.

Forest-fire hazard research as developed and conducted at the Petawawa Forest Experiment Station, J. G. Wright (*Canada Dept. Int., Forest Serv., Forest-Fire Hazard Paper 2 (1932), pp. II+57, pls. 22*).—Studies of various indexes to fire hazard in forests, namely, air and soil temperatures, relative humidity, evaporation as determined by Livingston atmometers, the moisture content of the duff, etc., are discussed, and the results set forth graphically.

Cover type as a factor in forest fire protection, J. A. Mitchell (*Jour. Forestry, 32 (1934), No. 1, pp. 96, 97*).—An analysis by the U.S.D.A. Lake States Forest Experiment Station of Michigan forest fire reports for the years 1928–32 showed 0.9, 47.3, and 51.8 percent of the area burned to have been merchantable timber, second growth, and nontimbered, respectively. Aspen-birch second growth and grass plains made up 25.2 and 30.4 percent of the total burned area. The author asserts that 5.5 ct. per acre annually would suffice to protect Michigan forests from extensive fires.

DISEASES OF PLANTS

Some significant estimates of losses from plant diseases in the United States, N. E. Stevens (*Phytopathology, 23 (1933), No. 12, pp. 975–984, figs. 9*).—The problem of interpreting estimated losses from plant diseases is discussed. Estimated losses in the United States are charted for the period from 1920 to 1929 for wheat bunt, peach brown rot, and storage rots of sweetpotatoes. The average annual loss from decay in certain forest products, as estimated by R. H. Colley, and the effect of cranberry false blossom disease on annual crop protection are also presented.

The influence of control campaigns in promptly checking annual losses due to certain plant diseases is indicated.

Handbook of plant diseases, I, founded by P. Sorauer (*Handbuch der Pflanzenkrankheiten. Berlin: Paul Parey, 6 ed., rev., 1933, vol. 1, pp. X+592, figs. 123*).—The fifth edition of this work has been noted (E.S.R., 61, p. 582).

The present volume (under the editorship of O. Appel, with the cooperation of K. Braun, E. Hiltner, E. Köhler, F. Merkenschlager, H. Morstatt, K. O. Müller, E. Pfeil, O. Schlumberger, E. Tiegs, and H. Wartenberg) deals with nonparasitic diseases. It is divided into two sections, of which the first section is introductory and general in scope, dealing with the history of plant pathology, the concept of disease, and the many-sided relationships between disease factors and environment, furnishing withal the physiological and ecological background for plant disease study. The second section of the book takes up plant nutrition in relation to disease, climatic factors as a cause of nonparasitic diseases, and temperature extremes (heat and cold) as factors in death and disease.

Virus diseases of plants, J. Grainger (*London: Oxford Univ. Press, 1934, pp. VIII+104, pls. 6, figs. 5*).—The author's aim has been to introduce the student to the phenomena associated with virus diseases rather than to provide him with descriptions of all known viruses. It is typical rather than complete. The subject sections included are as follows: The relation of a virus to its host plant, properties of the virus extract, the relation of insects to virus diseases, economic effects and measures of control, the classification and description of virus diseases, and general experimental work. Descriptions of the various items of technic in common use and 445 literature references are included.

The pathogenicity and seasonal development of Gymnosporangium in Iowa, D. E. Bliss (*Iowa Sta. Res. Bul. 166 (1933), pp. 337–392, figs. 21*).—Studies of the cedar-apple rust organism (*G. juniperi-virginianae*) indicated the existence of distinct physiologic strains, since artificial inoculations showed Tolman Sweet and York Imperial to be very susceptible to a strain from Morgantown, W.Va., but resistant to strains from Iowa, Kansas, and Wisconsin. At the same time there was little evidence that trees of one variety of apple varied in susceptibility with reference to locality. Variations were observed in the resistance of red cedar seedlings, as indicated in different numbers of galls on similarly treated trees. Records are presented on the percentage of leaf area covered with lesions in the case of 138 apples and 28 crab apples growing in nurseries at Shenandoah, Iowa. Aecidiospores were matured on only 30 percent of these hosts.

Abundant sporulation was secured in from 6 to 7 hr. from air-dry galls, regardless of whether the period of soaking was 30 or 180 min. At temperatures of 5° to 13° C. the germination of aecidiospores increased for a period up to at least 22 days, while at room temperature germination dropped rapidly. At Shenandoah approximately 72 days intervened between infection and the first opening of aecidia of cedar-apple rust on Bechtel crab.

In *G. globosum*, the causal organism of hawthorn rust, a disease of minor economic importance in Iowa, the only appreciable germination of aecidiospores was secured in November from diseased hawthorn leaves taken from the soil and from leaves refrigerated 41 days at 5°.

Rusts of Tennessee, L. R. Hesler and A. Caton (*Jour. Tenn. Acad. Sci., 8 (1933), No. 3, pp. 260–263*).—An annotated list from the University of Tennessee.

[Plant disease studies in Arizona] (*Arizona Sta. Rpt. 1933, pp. 55–57, 67–75, figs. 3*).—Results are reported of studies of chlorosis and decline of citrus and other plants; breeding wheat resistant to smut; Texas root rot of pecans, deciduous fruits, and other crops; a bacterial streak disease of milo new to Arizona; *Fusarium* wilt-resistant watermelon for Arizona; relation of crown gall to temperature; psyllid yellows and early blight of potatoes; smuts of barley; root knot in peach orchards; a *Fusarium* disease of *Cereus schottii*;

heart rot of palms; *Phytophthora* rot of watermelon; and cotton angular leaf spot.

[Plant disease studies by the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 21 (1933), pp. 69, 70, 71, 94–99*).—Findings are briefly reported as to tomato seedling disease control, spraying for downy mildew of cantaloups, and downy mildew, root knot, and other diseases of tobacco.

[Plant disease studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 121–128*).—Results are briefly noted of studies by A. B. Burrell on cork and rosette diseases of apple; by C. O. Bratley on the incidence and development of apple scab on fruit during the late summer and in storage; by E. M. Hildebrand on spraying for fire blight; by F. M. Blodgett et al. on factors affecting the efficiency of potato spraying; by Blodgett, L. Stirland, and C. F. Taylor on scab, *Rhizoctonia*, and pitting of potatoes; by Blodgett, K. H. Fernow, and L. M. Black on virus diseases of potatoes; by C. Chupp on rots of turnip roots caused by *Macrosporium herculeum* and *Colletotrichum higginsianum*; by W. W. Stuart on control of downy mildew of lettuce; by A. G. Newhall and L. L. Hill on celery root and storage rots; by P. P. Pirone on control of carrot blight; by Newhall et al. on control of spinach damping-off; by Newhall and Stuart on the seed-borne nature of onion mildew; by E. Felix on *Pythium tracheophilum* as the pathogen in wilt and root rot of lettuce; by D. S. Welch on *Nectria* canker of basswood and apple; by L. M. Massey et al. on diseases of roses; by D. K. O'Leary on diseases of lilies; by C. E. F. Guterman on the control of soft rot and root rot of the calla lily; by F. A. Haasis on mosaic and "fire" of narcissus bulbs; by D. L. Gill on leaf-nematode disease of begonia and a cutting rot of geraniums; and by Guterman on *Botrytis* blight of tulips and wilt resistance in asters.

[Plant disease studies of the New York State Station] (*New York State Sta. Rpt. 1933, pp. 29–33, 33–38, 40, 41, 42*).—Notes are given on the progress of studies of the value of lime-sulfur and other fungicides for the control of apple scab; mosaic, streak, and anthracnose in raspberries; nematode root knot of potatoes; yellow oxide of mercury as a treatment for seed potatoes; effect of hot water treatment on cabbage seed; Ceresan injury of wheat seed; and smuts of barley and wheat.

[Plant disease studies in North Carolina] (*North Carolina Sta. Rpt. 1932, pp. 31, 33, 35–38, 39, 40, 63, 64, 67, 68, 69–72*).—Data are reported on the kinds of fungi which cause damping-off of cotton seedlings and the treatment of seed with commercial dusts, by S. G. Lehman; the correction of soil conditions causing black rust of cotton on Cecil sandy loam in Iredell County, by C. B. Williams and W. H. Rankin; resistance to black root rot and black shank of tobacco, by E. G. Moss; chemical control of wilt and root rot diseases of tobacco and tomato, by R. F. Poole; blue mold, by Moss; tobacco mosaic, by Lehman; resistance to wheat rust, by P. H. Kime and Lehman; control of loose smut of barley, oat smut, and wheat rosette and mosaic, by Lehman; and the peach bacterial spot, root rot of the dewberry due to *Collybia dryophila* and other dewberry diseases, and prevention of diseases of sweetpotatoes, all by Poole.

Influence of Bordeaux mixture and an oil emulsion on water requirement, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 166 (1934), pp. 21–28, fig. 1*).—Coleus, tomato, cucumber, and potato plants growing in metal containers were sprayed with Bordeaux mixture, Volck oil, and a 50–50 mixture of these two materials. As measured by water loss and final dry weight of plants, Bordeaux mixture increased the water requirements of the first three species in soils maintained at 50 and 25 percent moisture. The Volck spray decreased the transpiration rate of the three species, whereas the combined spray differed little from the controls in results. The increasing effect of Bordeaux mixture and the depressing effect of oil were most pronounced on cloudy days. Bordeaux-sprayed plants were smaller at harvest than the controls but contained a higher percentage of dry matter than either the oil or the oil plus Bordeaux mixture treated plants. Coleus was most affected by Bordeaux mixture and oil emulsion, cucumber least, and the tomato intermediate.

Gibberella saubinetii (Mont.) Sacc. on British cereals, F. T. Bennett (*Ann. Appl. Biol., 17 (1930), No. 1, pp. 43–58, figs. 2*).—The occurrence of *G. saubinetii* is recorded on wheat and barley grown in England, the identification being verified by recovery of the organism after the completed life cycle from single conidium and single ascospore origins. The extent to which the fungus occurs in England is as yet unknown.—(*Courtesy Biol. Abs.*)

Physiological specialization in leaf rust of wheat (Puccinia triticina Erikss.) [trans. title], E. Radulescu (*Kühn Arch., 33 (1932), pp. 195–205, fig. 1*).—Fifty collections of leaf rust were tested, 10 from Germany, 1 each from Finland, Sweden, and Greece, and 37 from Rumania. These collections comprised 11 physiologic forms, 9 of which previously have been established as existing in Europe by Scheibe (E.S.R., 68, p. 54). In Rumania, besides the 9 known forms, an entirely new form, Key No. 54, was discovered. Most common proved to be forms 13 and 20. Scheibe's finding that the intensity and aggressiveness of specialization increased in an eastwardly direction was substantiated by the results of the author. Two geographic racial groups of leaf rust may be distinguished in Europe, one of an eastern and the other of a western orientation. The former consists primarily of forms 20, 21, and 24, while the latter is composed of forms 11, 14, and 15. Still another group, embracing forms 16, 17, and 19, appears sporadically in the west, as well as in the east. Form 13, on the other hand, is so widely distributed that it may be considered as the chief physiologic form of *P. triticina* in Europe.—(*Courtesy Biol. Abs.*)

A tropic response in germ tubes of urediospores of Puccinia graminis tritici, T. Johnson (*Phytopathology, 24 (1934), No. 1, pp. 80–82, fig. 1*).—When urediospores of *P. graminis tritici* germinate on wheat leaves or on any leaves or leaf parts with long and narrow epidermal cells, there is a well-marked tendency for the germ tubes to grow directly across the leaves, that is, to cross the cell walls at rightangles. The causal stimulus is thought to be of a thigmotropic nature.

Can one separate from common varieties of cereals races or lines resistant to smuts? [trans. title] O. Munerati (*Italia Agr., 70 (1933), No. 1, pp. 25–27*).—Experiments carried out, 1927–30, with the wheat varieties Gentile Rosso and Ardito Strampelli gave no evidence of lines of biotypes resistant to *Tilletia tritici*.—(*Courtesy Biol. Abs.*)

On the pathogenicity of Wojnowicia graminis, W. C. Broadfoot (*Phytopathology, 23 (1933), No. 12, pp. 1001, 1002*).—Single spore isolations of *W. graminis* from wheat plants at six widely separated points in Alberta, Canada, and 28 isolations of the fungus obtained from the crowns of wheat plants taken at random in a field were found to be nonpathogenic on two varieties of wheat when tested in the greenhouse. The spores from a pycnidium of *W. graminis* were found to be $36 \times 3.9 \mu$, with an average number of 6.8 septations, slightly larger and wider than those mentioned by J. H. J. Van de Laar in Europe.

Seedling stem blight of field beans caused by Rhizoctonia bataticola at high temperatures, J. B. Kendrick (*Phytopathology, 23 (1933), No. 12, pp. 949–963, figs. 5*).—This contribution from the University of California notes that a destructive seedling stem blight of Red Mexican, Red Kidney, and Pink beans occurs during periods of excessively high temperatures in the central valleys of California and is caused by *R. bataticola*. Seedling stem blight is characterized by black, somewhat sunken lesions on the upper part of the hypocotyl, which may involve the epicotyl and plumule and promptly kill the plant. Investigations conducted at Davis showed that infection takes place on the hypocotyl at the base of a cotyledonary petiole before or soon after the seedlings emerge from the soil. Epiphytotics have occurred when the seedlings came up during and immediately following periods of about 10 days or more in which the mean air temperature was 80° F. or more, with maximum daily air temperatures near or above 100°.

Inoculation experiments in artificially infested soil yielded a high percentage of typical seedling stem blight when the daytime soil temperatures averaged from 95° to 113° at 1-in. depth and from 81° to 95° at 3-in. depth, but little or no disease occurred when the daytime soil temperatures averaged from 72° to 82° at 1-in. depth and from 69° to 77° at 3-in. depth.

Identity and host relations of the Elsinoe of lima bean, S. C. Bruner and A. E. Jenkins (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 10*, *pp. 783–789*, *fig. 1*).—Using a culture of *Elsinoe* isolated by the U.S. Department of Agriculture from cultivated green lima beans collected at Wajay, Cuba, it was found in these experiments, carried on at the Agricultural Experiment Station, Santiago de las Vegas, Cuba, that under suitable conditions the species of *Elsinoe* causing lima bean scab readily infects uninjured leaves and pods of the wild or naturalized lima bean and of certain cultivated varieties, including Fordhook Bush and Henderson Pole. Infection was readily obtained by the cotton-plaster method on the upper and lower surfaces of young leaflets and on tender pods from 1 to 3.25 cm in length, the lesions appearing usually within 5 to 9 days. Under bell jars infection was secured by simply spraying lima bean plants with water containing bits of a culture. The legumes *Calopogonium caeruleum*, *Dolichos lablab*, *Phaseolus vulgaris*, *Pisum sativum*, *Canavalia gladiata*, *C. ensiformis*, and *Stizolobium deeringianum* were not infected by inoculations using the cotton-plaster method.

Stating that the lima bean *Elsinoe* is now better known than either of the two other species, namely, *E. canavaliae and E. calopogonii*, from both of which it is apparently distinct, the designation *E. phaseoli* Jenkins is proposed for the new species, and a technical description is provided.

Commelina nudiflora, a monocotyledonous host of a celery mosaic in Florida, S. P. Doolittle and F. L. Wellman (*Phytopathology*, *24* (*1934*), *No. 1*, *pp. 48–61*, *figs. 3*).—In this paper, contributed from the U.S.D.A. Bureau of Plant Industry, it is stated that in recent years a mosaic disease of celery has caused serious losses in Florida and has been noted in other portions of the United States. This mosaic appears to be distinct from those described by earlier workers on celery, since in addition to a definite mottling and absence of malformation of the leaflets it also produces discoloration and shriveling of the leafstalks. The virus is transmitted by mechanical inoculation and by *Aphis gossypii*, the latter being the chief means of dissemination in the field. Celery mosaic has also been transmitted to cucumber, tobacco, tomato, and the cultivated groundcherry. The symptoms on these hosts are much like those of the ordinary form of cucumber mosaic, but the two viruses are not believed to be identical. The virus of celery mosaic does not appear to live in the soil or seed, but the disease occurs commonly on a monocotyledonous host (*C. nudiflora*). Field studies have shown that the primary infection of celery can be traced directly to mosaic *Commelina* plants near the borders of the fields, and that *A. gossypii* acts as the vector from the wild to the cultivated host.

It is believed that the eradication of *Commelina* is a practicable means of controlling celery mosaic under Florida conditions.

Resistance of red clovers to Sclerotinia trifoliorum Erik., and infection studies, W. D. Valleau, E. N. Fergus, and L. Henson (*Kentucky Sta. Bul. 341 (1933), pp. 113–131, fig. 1*).—Field studies in 1932 and 1933 showed that the varieties of red clover adapted to central Kentucky conditions were injured less by stem rot caused by *S. trifoliorum* if spring sown than were other American and European varieties. The resistance appeared to result directly from superior adaptation to local environmental conditions, which in turn results in tissues of a higher degree of resistance, rather than to be a resistance to local physiological forms of *S. trifoliorum* or the expression of inherent genetic resistance.

The infection of new plantings of clover and alfalfa appeared to result from wind-borne ascospores and not from soil infestation, sclerotia introduced with seed, or hyphae in seeds. Infection of leaves and petioles of red clover, according to the observations reported, occurs directly from germinating ascospores. Following death of the leaves from other causes, *S. trifoliorum* is found in the dying petioles and may thus have direct access to the crown. The saprophytic stage of the fungus seemed to be secondary to the parasite stage in the leaf and of little importance except perhaps when plants are dying rapidly from direct infection. *Plantago lanceolata*, pyrethrum, and *Lactuca* sp. were found to be hosts of *S. trifoliorum*. The authors suggest that *S. minor* and *S. trifoliorum* are identical.

A plant inoculator, S. S. Ivanoff (*Phytopathology, 24 (1934), No. 1, pp. 74–76, fig. 1*).—An instrument for making easy, rapid, and uniform puncture inoculations, devised at the Wisconsin Experiment Station for work on resistance to bacterial wilt of corn, is described. Four men in 4 days inoculated more than 100,000 plants.

Resistance of dent corn to Basisporium gallarum Moll., C. S. Reddy (*Iowa Sta. Res. Bul. 167 (1933), pp. 40, figs. 6*).—Studies of *Basisporium* dry rot concerned with its effect on corn seed and seedlings and possibilities of reducing injury in this stage by seed treatment, resistant strains, or time of planting are reported, with remarks on a simple chemical test which may be of use to breeders in determining resistance or susceptibility of inbred strains of corn to *Basisporium* dry rot.

The injury by *B. gallarum* is associated with cessation of translocation within the corn plant, and occurs at the time of germination, after normal maturity, and when plants die prematurely from cold or other causes. Seed infected by *B. gallarum* were seen to die within a few days after planting in soils slightly below the temperature range for germination. The organism kills the germ before active translocation, i.e., germination sets in, and germination marks a change in the embryo from neutral to acid reaction. Acid reaction in the cob was shown to be correlated with resistance to *Basisporium* infection. The fact that the germinating kernel becomes resistant at the same time that the embryo becomes acid suggested a similar correlation between acidity and resistance in the seed. Good field stands evidently are correlated with warm soil temperatures which promote rapid germination, and poor field stands with cold soil temperatures which make germination slow. Seed treatment seemed most beneficial under conditions suitable for greatest injury by *B. gallarum*, i.e., cold soil at time of germination.

Experimental results showed that strains of corn germinating below 11° C. are resistant to *Basisporium* seed rot, and that simple cob reaction (pH value) tests will strongly indicate the resistance or susceptibility of an inbred strain to the ear rot. Indications were that tests on a number of cobs will determine whether or not the inbred corn is homozygous for the character.

Stripe disease of maize, R. E. D. Baker (*Trop. Agr.* [*Trinidad*], *10* (*1933*), *No. 12, p. 352*).—An experiment is reported in which new leaves showing obvious symptoms of stripe disease developed on a diseased plant from which insects were excluded. Since the recovery of diseased plants in the field has never been observed, it is concluded that the disease is due to a virus and not to a stigmonose.

Stewart's wilt disease of corn, with emphasis on the life history of Phytomonas stewarti in relation to pathogenesis, S. S. Ivanoff (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 10, pp. 749–770, pls. 3, figs. 2*).—The symptoms of Stewart's disease of corn, caused by *P. stewarti*, are described for both field and sweet corn from studies at the Wisconsin Experiment Station, where particular attention was given to the life history of the causal organism in relation to pathogenesis.

The bacteria were observed to enter host tissue through bruised and wounded roots in artificially infested soil and through wounds made by white grubs (larvae of *Phyllophaga* sp.), but did not enter through the broken pericarp at germination or through unwounded roots. In the leaf and husk tissue the bacteria escaped from the vessels and entered the parenchyma, and their presence and activities within ruptured cells and between cells caused discoloration, plasmolysis, and death. In the stem, shank, and cob the bacteria were found in the vessels, in the large air spaces of some of the bundles, in masses in the disrupted pith tissue, and as exudate upon the shank surface. In the tassel they were located in the vessels of rachises, rachillas, glumes, and filaments. A selective medium was developed with which the bacteria were recovered from overwintered corn stubble, from decaying roots and stems, from disintegrating parts of diseased kernels after germination, and from artificially infested soil. Larvae of *Diabrotica longicornis* transmitted the disease from diseased to healthy plants. Other bacterial cultures, apparently different from the typical Stewart's wilt organism in some cultural and physiological characters, produced symptoms more or less resembling those of Stewart's wilt.

Iron as a means for combating chlorosis in the yellow lupine (Lupinus luteus) in lime-containing and limed soils [trans. title], S. Trwosch (*Ztschr. Pflanzenernähr., Düngung u. Bodenk.*, *31* (*1933*), *No. 1–3, A, pp. 14–27*).—The chlorosis of the yellow lupine, characterized by yellow discoloration and later by rolling and falling of the leaflets, is caused by calcium, the severity of the injury increasing with the amount of calcium in the soil. The chlorosis always appears with the third leaf, and the cotyledons, for the most part, are not affected.

High applications of iron (without Ca) are injurious to the growth of the yellow lupine, but on limed soils iron is beneficial. Iron in certain solubility and quantitative relations to the calcium content of the soil is able to prevent chlorosis. Chlorosis is not conditioned by the alkalinity of the soil, and there is no relationship between chlorosis and nodule bacteria.—(*Courtesy Biol. Abs.*)

Pod deformation of mosaic-infected peas, W. C. Snyder (*Phytopathology*, *24* (*1934*), *No. 1, pp. 78–80, fig. 1*).—Plants of the garden pea (*Pisum sativum*) affected with mosaic disease produced pods showing marked symptoms of malformation and deformity. Such pods were badly stunted or assumed a rough, ridged, wrinkled condition. The ridges usually appeared dark green in color. Foliage symptoms also occurred, consisting of mottling, spotting, curling, and stunting of the leaves.

Seed treatment for potato blackleg, J. Tucker and E. W. Harber (*Sci. Agr., 14 (1933), No. 2, pp. 70–72*).—Records kept for five consecutive years and involving approximately 45,000 fields inspected for seed potato certification are summarized to compare the blackleg infection in fields planted with nontreated seed with that in fields planted with seed treated with either bichloride of mercury or with formalin. The summaries show that both treatments definitely reduce the losses due to blackleg, but it is concluded that when certified seed is planted the cost of treatment is not warranted except where soil conditions are particularly favorable to blackleg development.

Losses from potato late blight in 1885 and 1886, N. E. Stevens (*Phytopathology, 24 (1934), No. 1, pp. 76–78, fig. 1*).—Information contained in a recently discovered manuscript indicates serious losses from potato late blight (*Phytophthora infestans*) throughout the northeastern United States in 1885 and less severe losses in 1886.

[Prevention of potato scab] (*Wyoming Sta. Rpt. 1933, pp. 29, 30*).—The effectiveness of various fungicides is compared.

Botrytis cinerea as a cause of potato tuber rot, D. Folsom (*Phytopathology, 23 (1933), No. 12, pp. 993–999, figs. 2*).—This is a contribution from the Maine Experiment Station.

The fungus isolated from actively expanding, rather soft rot lesions on potatoes stored in Maine produced the identical disease when inoculated under certain conditions, and a shallow lesion under others, as did also cultures from infected shoots and subcultures from single spores and hyphal tips. Mycelial cultures were much more effective than spores, and with natural infection proceeding from the stolon end of the tuber it is concluded that the fungus enters from diseased stems.

A study of the potato eelworm (Heterodera schachtii) in the Irish Free State, J. Carroll (*Jour. Helminthol., 11 (1933), No. 3, pp. 137–156, pls. 2, fig. 1*).—The author gives an account of the incidence of disease. No relation exists between the pH value of the soil and eelworm abundance. No control by fertilizing was effective, with the dubious exception of calcium cyanamide. The only other plant infected was the curled dock, but no transference of the parasite from one plant to the other was found possible.—(*Courtesy Biol. Abs.*)

Laboratory and field studies on the development and control of stem rot of rice, E. C. Tullis and E. M. Cralley (*Arkansas Sta. Bul. 295 (1933), pp. 23, figs. 6*).—The symptoms, hosts, and taxonomy of the fungus causing stem rot of rice are described, and results are reported from studies in cooperation with the U.S. Department of Agriculture on cultures of *Leptosphaeria salvinii*; pathologic histology; seasonal development; control of the disease by modified irrigation, burning stubble, fertilizers, and rotation; and varietal resistance.

The initial infections of stem rot of rice occur during July, and secondary infections may continue until the weather becomes too cold for further development of the fungus. Various reproductive stages of the fungus were found to infect cultivated rice, the aquatic grass *Zizaniopsis miliacea*, and short barnyard grass (*Echinochloa colona*). The three reproductive stages recognized include the sclerotial stage (*Sclerotium oryzae*), conidial stage (*Helminthosporium sigmoideum*), and ascigerous stage (*L. salvinii*) (E.S.R., 70, p. 636). The temperature optimum for growth was found to be from 25° to 30° C., and the optimum pH concentration was from 6.5 to 8.

The sequence of invasion of the plants by the fungus comprised invasion of the outer leaf sheaths of the plant, invasion of the culm, and disintegration of the culm tissue. Overwintering of the fungus occurs by means of sclerotia which produce primary infection. Conidia probably are a source of primary and secondary infection.

The most promising control measure tried, withholding standing water from the fields for a period prior to maturity, was found effective by growers. Preliminary results indicate it can reduce losses from the disease and may not depress yields appreciably compared with normal irrigation methods.

Observations on Tolyposporium filiferum, cause of "long smut" of sorghum, M. N. KAMAT (*Phytopathology, 23* (*1933*), *No. 12, pp. 985–992, figs. 4*).—Chlamydospores of this fungus from sorghum in India were germinated on various media and the types of germination studied. The minimum temperature for germination was between 10° and 13° C., the optimum about 28°, and the maximum a little above 39°. About 100 monosporidial lines were isolated. Most behaved alike on solid media, but some variants were noted, and sectoring was also found.

Pathogenicity, host response, and control of Cercospora leaf-spot of sugar beets, E. F. VESTAL (*Iowa Sta. Res. Bul. 168* (*1933*), *pp. 41–72, figs. 8*).—The several studies reported dealt with the growth habits and sporulation of *C. beticola* on artificial media, its host range, the control of *Cercospora* leaf spot by spraying and dusting, and the influence of spacing upon the development of *Cercospora* leaf spot.

Conidia of *C. beticola* began to appear on artificial media in from 12 to 20 hr. after inoculation, the optimum production occurring from 48 to 96 hr. after transfer. The conidium may germinate at any point, but more often near a septum and from the basal end of the cell first, but germination did not take place on the living leaf in an atmosphere containing less than 90 percent humidity. Air humidity of 75 percent was necessary for any conidial formation, and increasing humidity from 75 to 96 percent produced an increase in conidial length from 100.4 to 185.2 μ. Only a small percentage of the germ tubes growing over the leaf surface penetrated the stomata, and such penetration apparently was not influenced by variations in the humidity of the air surrounding the plant. *C. beticola* readily infected sugar beet seedlings, producing both hypocotyl and cotyledon infection.

Twenty-six species of plants pertaining to 12 families were infected under greenhouse conditions by spraying with suspensions of conidia of *C. beticola*, indicating the wide host range of the organism among plants of the sugar beet area. Under field conditions six species of plants in six families were found infected with a *Cercospora* sp. resembling *C. beticola*. Conditions under which *C. beticola* was found growing in the field indicated that it might at times be a saprophyte.

Application of fungicides for control of the disease *Cercospora* leaf spot did not result in a significant increase in beet and sugar yields. The significantly greater yields of beets from 20-in. machine blocking than from either 12- or 24-in. more than compensated for the slightly greater percentage of sugar in the beets in the 12-in. blocking. No significant differences were found in purity. The 20-in. blocking retarded the spread of leaf spot about 10 days compared with 12-in. blocking, which reduced the number of dead leaves as much as 16 percent below that of the 12-in. blocking. Since the use of machinery makes possible more rapid and uniform cultivation than is usual by hand, which in turn makes possible a more effective weed control and maintenance of a lower humidity among the beet leaves, indications are that the same measures which reduce the spread of leaf spot may also reduce production costs and increase yields in 20-in. blocking.

Stomatal infection with the virus of typical tobacco mosaic, B. M. DUGGAR and B. JOHNSON (*Phytopathology, 23* (*1933*), *No. 12, pp. 934–948, fig. 1*).—Young tobacco plants were sprayed with a partially purified suspension of the virus of tobacco mosaic at 1-, 2-, and 4-hr. intervals during 24-hr. periods. At the same time samples of epidermis of comparable tobacco plants were fixed and preserved in order to determine the extent of stomatal openings. Temperature and humidity records were maintained. The spray method of applying the virus induced an average incidence of infection of about 70 percent. At no interval during any 24-hr. period were all the stomata closed. There was some correlation between areas of stomatal pore openings and percentage of infection, but there was no apparent correlation between the percentage of infection and the temperature or humidity. Applying the virus suspension in grosser amounts (mass application), with no small droplets, resulted usually in a comparatively low incidence of infection.

It is suggested that mist particles carrying the virus may be "shot" through the open stomata, or the suspension may creep in through the action of surface forces when the virus is distributed over the leaf as a result of the spraying technic employed. The mechanism of penetration into the cell is discussed.

Isolation of yellow-mosaic viruses from plants infected with tobacco mosaic, J. H. JENSEN (*Phytopathology, 23 (1933), No. 12, pp. 964–974, figs. 2*).—Yellow mosaic viruses, considered to be aberrant strains arising from ordinary tobacco mosaic, were isolated from bright yellow spots on leaves of *Nicotiana tabacum* variety Turkish, *N. sylvestris*, and *Lycopersicum esculentum* plants inoculated with tobacco mosaic virus shown to be free from all other viruses and protected against accidental infection. Many of the yellow mosaic viruses differed from each other in the symptoms produced in tobacco and other plants. The symptoms produced by three isolations are briefly described. The evidence indicated that viruses of yellow mosaic arise during multiplication of tobacco mosaic virus in infected plants.

A commercial apple-spraying demonstration in 1932, W. G. KENT (*Jour. Min. Agr. [Gt. Brit.], 40 (1933), No. 5, pp. 420–430*).—In a comparison of 4 Bordeaux sprays of 3.25–5–40 (hydrated lime) with 4 lime-sulfur sprays of 1–30, 1–30, 1–79, and 1–100, the former gave better scab control and a higher percentage of clean fruit. Twenty-three days elapsed between the first and the pink spray, 14 between the pink and petal fall, and 20 between petal fall and the last application. A slight purpling of the foliage on the Bordeaux mixture plats developed by late summer.—(*Courtesy Biol. Abs.*)

Spraying experiments on the control of pear scab at East Malling, M. H. MOORE (*Jour. Min. Agr. [Gt. Brit.], 40 (1933), No. 2, pp. 111–119, figs. 4*).—Spraying tests on 80 9-year-old Fertility pear trees in 1931 and 1932 showed that three applications (at white bud, petal fall, and three weeks later) of Bordeaux mixture 8–12–100, made with hydrated lime, provide a good basic spray program, which should be supplemented if seasonal conditions demand. Lime-sulfur was also effective and would be more useful where red spider is prevalent, and possibly where pears are interplanted with apples. Colloidal sulfur gave unsatisfactory results.

Rootstock influence on scion susceptibility to scab was shown, the trees on quince C bearing more heavily infected fruits than those on either quince A or B.—(*Courtesy Biol. Abs.*)

An infectious rosette of peach trees, D. CATION (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 79–84, figs. 3*).—Peach rosette was reported from several townships in Berrien County. In one case buds taken from a rosetted tree, although failing to live themselves, inoculated the trees in which set. In another instance where the buds survived the budded trees showed symptoms of rosette the following season. Certain differences between the symptoms observed in Michigan and those described in southern States are pointed out, but whether the differences were due to environment or to different characteristics could not be established.

Crinkle disease of strawberry, S. M. Zeller (*Oregon Sta. Bul. 319 (1933), pp. 14, figs. 4*).—Crinkle disease, described as a mosaic-like, systemic affection appearing first as yellowish, pinpoint spots on the leaves, which soon become crinkled and unevenly streaked and spotted with yellowish tissues, is said to have caused the gradual degeneration of the Marshall strawberry and to have attacked various other varieties, including Corvallis and Ettersburg 121. The affected plants often yield less than half the crop of healthy plants and are less winter hardy. Under field conditions the disease is spread by the propagation of infected plants, and a plan is outlined by the author for control by selecting healthy plants from beds one year or more in age. The crinkle disease was found to be carried from plant to plant by the strawberry leaf louse (*Myzus fragaefolii*), making essential the isolation of propagation beds. The virus was not carried over from organic females to the young offspring. A system of artificial inoculation is described for demonstrating the absence of crinkle in supposedly healthy stock.

Strawberry dwarf, J. R. Christie and N. E. Stevens (*U.S. Dept. Agr. Circ. 297 (1933), pp. 8, figs. 3*).—This circular is a revision of and supersedes Circular 174, Field Observations on Strawberry Dwarf (E.S.R., 66, p. 48).

A species of Sphaceloma on avocado, A. E. Jenkins (*Phytopathology, 24 (1934), No. 1, pp. 84, 85*).—This species, causing scab of the avocado (*Persea americana*), is diagnosed as *S. perseae* n.sp.

Root rot of Primula obconica caused by Thielaviopsis basicola (Berk. et Br.) Ferraris, B. A. Tiddens (*Wortelrot van Primula obconica veroorzaakt door Thielaviopsis basicola (Berk. et Br.) Ferraris. Proefschr., Rijks-Univ., Utrecht, 1933, pp. [7]+80, pls. 4, figs. 2; Eng. abs., pp. 73–75*).—By means of inoculation experiments it has been proved that the frequent occurrence of a root rot of *P. obconica* in Dutch nurseries is caused by *T. basicola*. External conditions may influence the amount of damage, as well as the growth of the fungus. Inoculations were most successful when performed at temperatures at which *T. basicola* develops well (20° to 26° C.).

The fungus develops well in malt solutions, of which the pH varies over a range of from 5.2 to 8.0, but in more acid solutions growth decreases. *Primula* grows best in culture solutions of v.d. Crone with boric acid, if the pH is about 6.4. At this pH the damage caused by inoculation is serious. It decreases by using more alkaline solutions, while in more acid solutions in which *Primula* develops poorly the amount of damage is still serious. On the contrary, by taking soil suitable for culture of *P. obconica* an increase of the pH does not decrease the amount of damage. On adding sulfate of ammonia the plants show serious symptoms of disease. Compact soil favors the disease. Adding mud (bagger) to a mixture of garden soil, leaf mold, and manure is not deemed advisable, while the addition of peat litter will have a favorable influence.

To control this root rot, various methods of soil disinfections are recommended.—(*Courtesy Biol. Abs.*)

Pecans infected with Nematospora coryli, G. F. Weber (*Phytopathology, 23 (1933), No. 12, pp. 1000, 1001, fig. 1*).—This fungus was isolated at the University of Florida from brown areas on kernels. The infections cannot be detected until the shells are removed. Connection with "kernel spot" due to sucking insects is suspected.

Another powdery mildew on crape myrtle, E. West (*Phytopathology, 23 (1933), No. 12, pp. 1002, 1003*).—In studies at the Florida Experiment Station, perithecia of a second powdery mildew (*Phyllactinia corylea*) are reported on crapemyrtle from Alabama. *P. corylea* produces a sparser growth than does *Erysiphe lagerstroemiae*, the common fungus, on this host (E.S.R., 70, p. 496).

Variability in monoconidial cultures of Venturia inaequalis, D. H. Palmiter (*Phytopathology, 24 (1934), No. 1, pp. 22–47, figs. 3*).—In studies reported from the Wisconsin Experiment Station, monoconidial cultures of *V. inaequalis* were found to differ in colony characters, rate of growth, and sporulation. The species of *Amelanchier, Aronia, Cotoneaster, Crataegus*, and *Sorbus* studied were not infected, but 9 out of 13 *Malus* species were infected. Five apple varieties were resistant to certain cultures and susceptible to others under greenhouse conditions. Conidial length was found to vary with the culture used and the apple variety infected. This study indicates that *V. inaequalis* is made up of several strains that differ in various degrees in their morphologic and physiologic characters.

Three new diseases of ornamentals [trans. title], S. J. du Plessis (*Ann. Univ. Stellenbosch, 11 (1933), A, No. 2, pp. 16, figs. 5; Eng. abs., p. 13*).—The symptoms of three new diseases of ornamentals are described. *Phoma gaillardiae* n.sp. is the cause of a leaf spot and die-back of *Gaillardia*. The disease, favored by moist conditions and improper use of fertilizers, can be controlled by increased ventilation and applications of 2–2–50 Bordeaux mixture. A leaf spot of *Chrysanthemum* caused by *Epicoccum chrysanthemi* n.sp. can be controlled by proper ventilation and applications of 4–4–50 or 2–2–50 Bordeaux mixture. A black foot disease of *Stapelia* and related plants is caused by *Triposporium stapeliae* n.sp.

Since infections occur at the crown, soil sterilization, sanitation, and spraying with 4–4–50 Bordeaux mixture are suggested for control.

Latin descriptions of the three pathogens are given.—(*Courtesy Biol. Abs.*)

Control of elm leaf spots in nurseries, J. A. Trumbower (*Phytopathology, 24 (1934), No. 1, pp. 62–73, figs. 3*).—Spraying and dusting were conducted experimentally on elm nursery stock in eight northern Illinois nurseries. Three common leaf spot fungi, namely, *Gnomonia ulmea* (*Gloeosporium ulmeum*), *G. ulmicolum*, and *G. inconspicuum*, found on white elms (*Ulmus americana*), were controlled satisfactorily with five different fungicides. Koloform, dry, wettable flotation sulfur, 4–4–50 Bordeaux mixture, Kolodust, and flotation sulfur dust were the fungicides used. Three applications of the above fungicides reduced the leaf spot infection as much as from 40 to 90 percent, depending on the location of the plat and the amount of infection that developed.

Mode of entrance and periods in the life cycle of Cronartium ribicola on Pinus monticola, H. G. Lachmund (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 10, pp. 791–805, fig. 1*).—In studies carried on chiefly in southwestern British Columbia, where the blister rust has been longest established in western North America, the author found that the mode of infection in *P. monticola* as in other aecial hosts of *C. ribicola* is through the needles. The initial discoloration, marking the incipient canker in the bark, was observed to be almost invariably centralized symmetrically about a single needle bundle the base of which is usually swollen and the needles of which have at least one characteristic rust infection spot. On trees more than 3 ft. tall and 8 yr. of age the incubation period may cover 20 to 26 mo. On younger trees, up to 4 or 5 yr. of age, the incubation period is generally about a year shorter than in the older trees; in fact, incipient cankers were observed in these younger trees after a possible minimum of 6 mo. The hazard of spreading the disease by shipments of infected seedlings not yet manifesting symptoms is emphasized.

Following incubation, periods ranging from less than 1 to 10 mo. were required for the production of pycniospores. Following the production of these spores, from 6 to 30 mo. were usually required for the production of aeciospores. However, on the largest trees under certain circumstances 10 to 20 yr. elapsed before aeciospores were produced. For trees more than 3 ft. high and 8 yr. old the usual period for aeciospore production ranged from 2.5 to 5 yr.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Grazing habits and food requirements of game animals (*Arizona Sta. Rpt. 1933, pp. 80–82*).—Brief reference is made to work under way with game animals.

Amendment of regulations 4 and 5 of the regulations respecting game animals, land fur-bearing animals, game birds, nongame birds, and nests and eggs of birds in Alaska (*U.S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 11, Sup. (1933), pp. 2*).—The amendments relate to the possession and transportation of fur-bearing animals and to marking shipments of game animals, game birds, land fur-bearing animals, or parts thereof (E.S.R., 70, p. 498).

[Abstracts of fur laws, 1932–33 and 1933–34] (*U.S. Dept. Agr., Bur. Biol. Surv., 1933, Jan., pp. 26; Oct., pp. 26*).—These mimeographed abstracts furnish information on the fur laws, publication of the annual bulletin relating thereto (E.S.R., 66, p. 447) having been suspended.

Condensed information on rabbit repellents, J. A. Neilson (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 59–62*).—In tests made in 1930 in which numerous trees at East Lansing were treated with various repellents, rabbits being kept in confinement within a corral in which they were forced by hunger to feed on trees, a home-made mixture composed of resin 5 parts and linseed oil 1 part; a mixture composed of resin 35 lb., fish oil 15 lb., and copper soap (copper oleate) 15 lb.; and the commercial products Hood River Tree Paint and Tree Saver were the most efficient.

[Report of work with economic insects and rodents in Arizona] (*Arizona Sta. Rpt. 1933, pp. 41–45, fig. 1*).—The work under way is referred to regarding scale insects (*Parlatoria oleae* Colv.), water requirements of desert animals, and life histories and ecology of grasshoppers (E.S.R., 68, p. 782).

Fifty years' progress of American ornithology, 1883–1933 (*Lancaster, Pa.: Amer. Ornithol. Union, 1933, pp. 249, pl. 1*).—This memorial volume, prepared by a committee consisting of F. M. Chapman and T. S. Parker, includes the following contributions: A Brief History of the American Ornithologists' Union, by T. S. Palmer (pp. 7–27); American Ornithological Literature, 1883–1933, by W. Stone (pp. 29–49); Fifty Years of Bird Migration, by W. Rowan (pp. 51–63); Bird Banding, by F. C. Lincoln (pp. 65–87); The Theory of Territorialism and Its Development, by M. M. Nice (pp. 89–100); Advances in Life History Work, by H. Friedmann (pp. 101–109); Economic Ornithology, by W. L. McAtee (pp. 111–129); Collections of Birds in the United States and Canada: Study Collections, by J. L. Peters (pp. 131–141); Collections of Birds in the United States and Canada: Exhibition Collections, by F. M. Chapman (pp. 143–157); History and Progress of Bird Photography in America, by A. O. Gross (pp. 159–180); Fifty Years of Progress in American Bird-Art, by G. M. Sutton (pp. 181–197); Fifty Years of Bird Protection in the United States, by T. G. Pearson (pp. 199–213); Ornithological Education in America, by A. A. Allen (pp. 215–229); and Development of Our Knowledge of Fossil Birds, by A. Wetmore (pp. 231–239).

Experiments on the digestion of food by birds, J. STEVENSON (*Wilson Bul., 45 (1933), No. 4, pp. 155–167*).—In studies conducted and here considered in connection with a list of 20 references to the literature, the author has found passerine birds to feed more or less continuously during the daylight hours. "Female birds of several passerine species possess relatively longer small intestines than do males, and immature birds of some species possess relatively longer intestines than do the adults. The relative length of the small intestine is uniform among many insectivorous and omnivorous species, but there is an indication that it is longer in some birds living on small mammals, birds, amphibians, and fish.

"In some species of passerine birds, the first voided excrement from a stomach full of food appears in about 1½ hr., the last in about 2½ hr. Some species of birds when feeding on grain daily consume an amount equivalent to 9.6 percent of their body weight. About 90.4 percent of the food ingested is utilized by the bird, the rest is excreted. Passerine birds tend to decrease the amount of their feeding on hot days. The survival time of small passerine birds without food is relatively short, even at the most favorable temperature. Food in sufficient quantity is a factor of considerable importance in controlling the migration and regulating the abundance of birds."

The eggs of Japanese birds, VII, K. KOBAYASHI and T. ISHIZAWA (*Rokko, Kobe, Japan: Keisuke Kobayashi, 1933, pp. [1]+85–97, pls. 5*).—This is a continuation of the work previously noted (E.S.R., 70, p. 647).

[Fish investigations by the Cornell Station], G. C. EMBODY (*[New York] Cornell Sta. Rpt. 1933, pp. 106, 107*).—In reporting upon control work with hatchery diseases of trout, mention is made of the influence of iodized food on the resistance of trout to furunculosis. This is followed by a reference to bass-cultural investigations and to the influence of temperature and other factors on the development of trout eggs and the absorption of the yolk in trout fry.

Differentiation of the third larval stadium of the Ancylostomidae of man, dog, and cat [trans. title], M. EISMA (*Acta Leiden. Scholae Med. Trop., 7 (1932), pp. [6]+160, pls. 8, figs. [70]*).—This work has been noted from another source (E.S.R., 68, p. 812).

The influence of civilization on the insect fauna of North America (*Ann. Ent. Soc. Amer., 26 (1933), No. 3, pp. 497–528*).—At the symposium before the Entomological Society of America at its twenty-sixth meeting at Atlantic City, N.J., contributions were presented on the influence of civilization on the insect fauna of forests, by S. A. Graham (pp. 497–503); in regions of industrial activity, by P. W. Claassen (pp. 503–510); in cultivated areas, by R. C. Smith (pp. 510–518); and by purposeful introductions, by H. S. Smith (pp. 518–528).

Report of the entomologist, S. R. VANDENBERG (*Guam Sta. Rpt. 1931–32, pp. 20–22, fig. 1*).—Reference is made (E.S.R., 66, p. 448) particularly to observations of European corn borer parasites and briefly to house fly and stable fly parasites.

[Report of work with economic insects by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 105, 106, 108–113*).—In reporting upon the work of the year (E.S.R., 69, p. 72), the following insects of economic importance are considered: The woolly maple leaf scale *Phenacoccus acericola* and its control by the ladybird beetle *Hyperaspis signata*, the webbing clothes moth, dermestid larvae injurious in dwelling houses, and biology of the columbine borer, all by G. W. Herrick and G. H. Griswold; a snout beetle, *Otiorhynchus (Brachyrhinus) ligustici*, found near Oswego for the first time in this country; *Anopheles walkeri* as a carrier of malaria, by R. Matheson;

transmission of fowl pox by mosquitoes, by Matheson and A. L. Brody; honeybees in fruit pollination and the effect of temperature on bee activities, both by A. W. Woodrow; and millipedes and scab gnats in relation to potato tuber defects, potato spraying experiments on muck land, onion thrips control, control of the tarnished plant bug on celery, the wheat wireworm attacking potatoes, control of the potato flea beetle and aphids attacking potatoes on Long Island, and gladiolus thrips control, all by G. F. MacLeod.

[Report of work with economic insects at the New York State Station] (*New York State Sta. Rpt. 1933, pp. 33, 54–71*).—The work of the year (E.S.R., 68, p. 637) is referred to under the headings of red mite investigations; apple insects, including the codling moth and the white apple leafhopper; pear insects, including the pear midge, green stinkbug, *Euschistus euschistoides*, and E. *variolarius;* investigations of tar distillate sprays; insects affecting canning crops, including the cabbage root maggot, cabbage worms, and the cherry fruit fly; the oriental fruit moth; nursery and ornamental pests, including the gladiolus thrips, spruce gall aphid (*Adelges abietis*), strawberry root weevil and black vine weevil, and shade tree and evergreen insects; responses of orchard insects to light; the apple maggot, apple curculio, plum curculio, and other apple insects in eastern New York; the European corn borer, the corn ear worm, the Mexican bean beetle, potato insects, and the arsenical residue problem on Long Island.

[Report of work in entomology at the North Carolina Station] (*North Carolina Sta. Rpt. 1932, pp. 41, 42, 45, 59–61, 73–75*).—The work of the year referred to (E.S.R., 68, p. 497) includes that with insect infestation of stored corn and leafhoppers on peanuts (the potato leafhopper), both by B. B. Fulton; the wintering of bees and a survey of the honey-producing plants of the State, both by F. B. Meacham; and studies of the corn ear worm, by Fulton.

Report of the entomologist, C. Smee (*Nyasaland Dept. Agr. Ann. Rpt., 1932, pp. 48–52*).—A report of the occurrence of and work with the more important economic insects of the year, with particular attention to locusts, which invaded the Protectorate after a period of more than 20 yr. of freedom from them.

Entomology, I. B. Pole-Evans (*Farming in So. Africa, 8 (1933), No. 93, pp. 488–490*).—The occurrence of and work with the more important insects of the year in the Union of South Africa are dealt with.

Insects injuring vegetable crops in 1930, W. E. Britton (*Conn. Veg. Growers' Assoc. Rpt. 1930, pp. 37–39*).—This contribution from the Connecticut [New Haven] Experiment Station deals briefly with the more important insect enemies of vegetable crops in Connecticut in 1930, particular mention being made of the corn ear worm, carrot rust fly, Mexican bean beetle, and European corn borer.

The reports for 1931 and 1932 have been noted (E.S.R., 70, p. 357).

A study of insect populations on celery in the Sanford, Florida, district, C. B. Wisecup and R. L. Miller (*Fla. Ent., 17 (1933), No. 4, pp. 53–62, figs. 4*).—In a survey of the general abundance of insects on celery in Florida it was found that the forms most abundant in the fields are not the ones that are most destructive. It is pointed out that the Thysanoptera and Diptera, which together comprise more than one half of the entire population, are of little economic importance. Aphids, ranking third in abundance in 1929–30, are not considered as serious a pest as some other insects, and usually little is expended for their control. Red spiders, ranking second in abundance in 1928–29 and fourth in 1929–30, are sometimes very troublesome. The greenhouse leaf tier, which has caused by far the most commercial damage to celery, ranked tenth and thirteenth in abundance in these years, and in the year of greatest abundance the adults captured comprised only 0.25 percent of the entire population collected.

Tar oil distillates as dormant spray material for fruit trees, R. H. Hurt (*Va. State Hort. Soc. Rpt., 36 (1931), pp. 99–104*).—The author concludes from studies conducted with the apple during the years 1929, 1930, and 1931 that tar oil distillate sprays are by far the best and cheapest materials to use in aphid control. As low as 2.72 percent tar oil of the proper grade gave very good commercial control of aphids. It appears that tar oil and lubricating oils can be combined without cutting down the efficiency of either oil, thus making it possible to control both aphid and scale insects with one application at a moderate cost.

Tar oil distillates as dormant spray materials for fruit trees, R. H. Hurt (*Virginia Sta. Bul. 293 (1933), pp. 16, fig. 1*).—This is a summary of information on the experimental results obtained in the use of tar oil creosotes in Virginia over a 7-year period (see above), accounts relating to which by Hough have been noted (E.S.R., 69, p. 239). The results clearly show that these materials can be safely applied to thoroughly dormant fruit trees, and that they are very effective in controlling aphids in the egg stage.

"The minimum amount of the heavy tar oil creosote that can be depended upon for good aphid control is approximately 2.5 gal. in 100 gal. of the spray mixture. Less than this amount cannot be depended upon for satisfactory control of aphids. When using tar oil creosotes and petroleum oils in combination for aphid and scale control, there should be not less than 2 gal. of petroleum oil with a viscosity of approximately 150° (Saybolt) and not less than 2.5 gal. of a good heavy grade tar oil creosote in each 100 gal. of the spray mixture.

"Tar oil creosotes and petroleum oils may be emulsified separately and used separately, or they may be emulsified separately or together and used in combination. It may be possible that certain manufacturers will furnish the fruit growers with either the straight tar oil creosote emulsions or with miscible forms of tar oil creosotes. In that event the tar oil creosote emulsions may be added to the home-made petroleum oil emulsions without any bad effect unless the manufacturer states otherwise.

"Tar oil creosote emulsions or tar oil-petroleum oil emulsions should be applied to fruit trees when they are thoroughly dormant. Tar oil creosotes have been applied to apple and peach trees after the bud scales had begun to move without injury, but that is not a safe practice and should not be followed by fruit growers."

The necessity for thoroughly covering the eggs with the tar oil creosote spray solutions in order to destroy them is pointed out. While these sprays may be applied to fruit trees at any time during the dormant season, the best results are obtained when the applications are made with the temperature not below 40° F. and preferably above 50°.

The penetration of insecticidal oils into porous solids, W. M. Hoskins (*Hilgardia [California Sta.], 8 (1933), No. 2, pp. 49–82, figs. 6*).—In the work here reported the author employed strips of the solid (paper, deadening felt, or bark) dipped into oils and other liquids at the bottom of test tubes as a standard method of studying the rate of penetration.

"The rate of penetration of liquids into a porous solid has been shown to be controlled by a property of the liquid, the penetrativity, and by a property of the solid, the average radius of its pores. . . . Mineral oils were found to follow the theoretical behavior, but very volatile or reactive materials spread less rapidly than predicted. The solvent action of light oils upon the resin in bark decreased the rate of penetration. For a wide variety of spray oils the penetrativity gave a measure of the relative rates of entry, and from graphs of spread, penetrativity, and time the relative ease of entrance into various solids could be determined. Data on surface tension, absolute and Saybolt viscosities, density, unsulfonatable residue, volatility, and penetrativity are given, together with details of the methods of determination. Solutions containing 5 to 10 percent of a very fluid substance such as kerosene spread somewhat faster than was calculated from their penetrativities. This was shown to be due to separation of the components.

"The total spread of known volumes of liquids through the same solids was studied by adding the liquids to strips either hung in closed test tubes or in the open air. No theoretical calculation of total spread could be made. Viscosity is important because it controls the time until maximum spreading is attained, and hence opportunity for evaporation and reaction with the air increases as the viscosity becomes greater. Volatility is of great importance especially when evaporation occurs freely. The higher the degree of refinement the greater the spread of oils, both in the open and within closed containers. Increasing the volume of oil gave spreads less than proportional to the volumes used, and the addition of more oil after spreading had ceased resulted in but little additional spread. Addition to the oils of fluid materials such as kerosene increased the total spread when evaporation was prevented but decreased it in the open.

"The rate of spread and the total spread were decreased by adding moisture to the strips. The difficulty of applying enough oil in aqueous emulsions is discussed. Preliminary field experiments bore out the need for using oils of fairly high refinement, low viscosity, and low volatility inasfar as these properties are mutually compatible."

A list is given of 25 references to the literature.

Results obtained with polychlorides and paradichlorobenzene against the larvae of Polyphylla fullo L. and Melolontha hippocastani F., Z. S. Golovyanko (*Bul. Ent. Res., 24 (1933), No. 4, pp. 531–536, pl. 1*).—This is a summary of some experiments conducted from 1930 to 1932, inclusive, on the sandy soils of Darnitza Forest Reserve (near Kiev, Ukrainian S.S.R.) and Kruilov Forest Reserve (near Kremenchug, Ukrainian S.S.R.). It was found that when the same quantity of chemical was applied to a given area paradichlorobenzene was more effective than polychlorides.

A study of three species of Philippine Derris, V. B. Uichanco (*Univ. Philippines, Nat. and Appl. Sci. Bul., 3 (1933), No. 2, pp. 129–239, pls. 7*).—The study here reported relates to the chemical examination of three species of *Derris*, namely, *D. elliptica*, *D. philippinensis*, and an undetermined species formerly thought to be *D. polyantha*. Included in the report are accounts of the distribution of *Derris* species in the Philippines, the commerce of derris root, cultivation of derris, its uses, biological studies, chemical investigations, preliminary tests, a supplement to Roark's digest of the literature of *Derris* (E.S.R., 67, p. 150), and classified bibliographies.

Termites and termite control, C. A. Kofoid et al. (*Berkeley: Univ. Calif. Press, 1934, pp. [3]+XXV+734, pl. 1, figs. 182*).—This report takes up the termites of the United States, Mexico, the Canal Zone, the West Indies, Hawaii, and the Philippine Islands. Following an introduction by A. A. Brown, the subject is dealt with in four separate parts.

In part 1 (pp. 1–335) termites and their biology are reported upon in 32 chapters as follows: Biological Backgrounds of the Termite Problem (pp. 1–12) and Climatic Factors Affecting the Local Occurrence of Termites and Their Geographical Distribution (pp. 13–21), both by C. A. Kofoid; The Constitution and Development of the Termite Colony, by S. F. Light (pp. 22–41); Some Factors Limiting the Distribution of Termites, by O. L. Williams (pp. 42–44); The External Anatomy of Termites, by S. F. Light (pp. 45–52); The Internal Anatomy of Termites and the Histology of the Digestive Tract, by H. J. Child (pp. 53–83); Protozoa in Termites, by H. Kirby, Jr. (pp. 84–93); Hydrogen-ion Concentration in the Termite Intestine, by M. Randall and T. C. Doody (pp. 94–99); The Association of Termites and Fungi, by E. C. Hendee (pp. 100–107); A World View of Termites (pp. 108–117), The Termite Fauna of North America, with Special Reference to the United States (pp. 118–126), and Habitat and Habit Types of Termites and Their Economic Significance (pp. 127–140), all by S. F. Light; American Subterranean Termites, Their Classification and Distribution, by S. F. Light and A. L. Pickens (pp. 141–147); The Biology and Economic Significance of the Western Subterranean Termite, *Reticulitermes hesperus* (pp. 148–174) and The Barren-Lands Subterranean Termite, *Reticulitermes tibialis* (pp. 175–177), both by A. L. Pickens; American Subterranean Termites Other Than, Those of the Pacific Coast, by T. E. Snyder (pp. 178–186); The Desert Subterranean Termite, *Heterotermes aureus*, by A. L. Pickens and S. F. Light (pp. 187–189); The Desert Termites of the Genus *Amitermes* (pp. 190–196) and Dry-Wood Termites, Their Classification and Distribution (pp. 197–200), both by S. F. Light; The Distribution and Biology of the Common Dry-Wood Termite, *Kalotermes minor*—I, Distribution and Means of Identification, by S. F. Light (pp. 201–207), and II, Life History of *Kalotermes minor*, by P. A. Harvey (pp. 208–224); Economic Significance of the Common Dry-Wood Termite—I, General Economic Significance, by S. F. Light (pp. 225–229), and Colonization of the Common Dry-Wood Termite in Wooden Structures, by P. A. Harvey (pp. 230–256); The Southern and Mountain Dry-Wood Termites, *Kalotermes hubbardi* and *Kalotermes marginipennis*, by S. F. Light (pp. 257–259); The Dry-Wood Termites of Eastern and Southern United tSates, by T. E. Snyder (pp. 260–263); The Damp-Wood Termites of Western United States, Genus *Zootermopsis* (Formerly *Termopsis*), by G. B. Castle (pp. 264–282); The Desert Damp-Wood Termite, *Paraneotermes simplicicornis* (pp. 283–285) and Termites and Growing Plants (pp. 286–292), both by S. F. Light; The Termites of Hawaii, Their Economic Significance and Control, and the Distribution of Termites by Commerce, by E. M. Ehrhorn (pp. 293–305); The Termite Fauna of Mexico and Its Economic Significance, by S. F. Light (pp. 306–311); The Termite Fauna of the West Indies and Its Economic Significance, by T. E. Snyder (pp. 312, 313); The Termite Fauna of the Canal Zone, Panama, and Its Economic Significance, by T. E. Snyder and J. Zetek (pp. 314–318); The Termite Fauna of the Philippine Islands and Its Economic Significance, by S. F. Light (pp. 319–322); and Wood-Boring Insects Whose Appearance or Workings Resemble Those of Termites, by E. C. Van Dyke (pp. 323–335).

In part 2 (pp. 337–483) chemical investigations are presented in 8 chapters, namely: The Toxicity of Chemicals to Termites, by M. Randall, W. B. Herms, and T. C. Doody (pp. 340–356); Wood Preservatives and Protective Treatments (pp. 357–388) and Commercial Proprietary Preservatives (pp. 389–403), both by M. Randall and T. C. Doody; Tests of Wood Preservatives to Prevent Termite Attack, Conducted by the Bureau of Entomology, U.S.D.A., by T. E. Snyder and J. Zetek (pp. 404–417); Paints and Termite Damage, by M. Randall, T. C. Doody, and B. Weidenbaum (pp. 418–432); Poison Dusts—I, Treatments with Poisonous Dusts, by M. Randall and T. C. Doody (pp. 433–446), and II, The Toxicity of Various Poisonous Dusts, by C. A. Kofoid and O. L. Williams (pp. 447–449); Treatment by Fumigation, by M. Randall, T. C. Doody, and B. Weidenbaum (pp. 450–471); and Ground Treatments, by M. Randall and T. C. Doody (pp. 472–483).

In part 3 (pp. 485–536) termite resistivity of wood and building materials is dealt with in 5 chapters as follows: A Standard Biological Method of Testing the Termite Resistivity of Cellulose-Containing Materials, by C. A. Kofoid and E. E. Bowe (pp. 487–513; I, Distribution of Extractive in Redwood—Its Relation to Durability (pp. 514–518), and II, The Crystalline Coloring Compounds in Redwood Extract (pp. 519–523), both by E. C. Sherrard and E. F. Kurth; Seasonal Changes in Wood in Relation to Susceptibility to Attack by Fungi and Termites, by C. A. Kofoid (pp. 524–531); and Wood Preference Tests (pp. 532, 533) and Tests on Wallboards and Insulating Materials (pp. 534–536), both by O. L. Williams.

In part 4 (pp. 537–725) prevention and repair of termite damage is taken up in 11 chapters as follows: General Recommendations for the Control of Termite Damage, by A. A. Brown, W. B. Herms, A. C. Horner, J. W. Kelly, C. A. Kofoid, S. F. Light, and M. Randall (pp. 539–551); Inspection and Maintenance, by C. A. Kofoid and G. E. Chase (pp. 552–558); Buildings, by A. C. Horner, E. E. Bowe, W. Putnam, and G. E. Chase (pp. 559–602); Power, Telephone, and Telegraph Lines, by R. C. Barton, H. Michener, and W. H. Hampton (pp. 603–634), with Appendix A, Results from the Preservative Treatment of Telephone Poles (pp. 635–665), and Appendix B, Bibliography (pp. 666–670); An Audio-amplifying System for Termite Detection, by R. C. Barton (pp. 671–674); Railroad Structures, by W. H. Kirkbride I, Railroad Signal Lines (pp. 675–684), and II, Bridges and Railroad Structures (pp. 685–691); Miscellaneous Exposed Structures, by A. C. Horner and G. A. Rader (pp. 692–694); Lumber Storage Piles—I, Recommendations for Preventing and Repairing Damage, by A. C. Horner and E. E. Bowe (pp. 695–699), and II, Experimental Studies of Methods for the Protection of New Lumber from Colonizing Dry-Wood Termites, by O. L. Williams (pp. 700–702); Legislative Action—I, Municipal Laws, by E. E. Bowe (pp. 703–705), II, State Laws, by W. C. Jacobsen and A. C. Browne (pp. 706–710), and III, Federal Quarantine Laws, by T. E. Snyder (pp. 711, 712); Prevention of Wood Decay in Buildings, by R. H. Colley (pp. 713–715); and Termites as a Factor in Earthquake Damage, by W. T. Steilberg (pp. 716–725).

A bibliography is included (pp. 726–734).

Life history and habits of the pigeon louse (Columbicola columbae Linnaeus), M. Martin (*Canad. Ent., 66 (1934), No. 1, pp. 6–16, figs. 6*).—This is a report of studies of the biology of the slender pigeon louse in Texas. The results of observations of the several stages and the development of this louse are recorded in detail in tabular form.

Growth and nutrition of Melanoplus differentialis Thomas (Orthoptera: Acrididae).—I, Growth on a satisfactory mixed diet and on diets of single food plants, C. Hodge iv (*Physiol. Zool., 6 (1933), No. 3, pp. 306–328, figs. 8*).—This is a report of a preliminary study which has indicated certain satisfactory and unsatisfactory diets for the differential grasshopper. The account is accompanied by a list of 25 references to the literature.

The Crytacanthrinae grasshopper, H. C. Severin (*South Dakota Sta. Rpt. 1933, pp. 25, 26*).—Brief reference is made to work continuing that of the previous year (E.S.R., 68, p. 780).

Preliminary notes on Scirtothrips in Egypt, with key and catalogue of the Scirtothrips species of the world, H. Priesner (*Bul. Soc. Roy. Ent. Égypte, 25 (1932), No. 3, pp. 141–155, pl. 1, figs. 2*).—The species *S. mangiferae*, which causes injury to the mango by stinging and sucking the tender buds, causing the leaves to dry out and die off, is described as new.

Contributions towards a knowledge of the Thysanoptera of Egypt, VIII, H. PRIESNER (*Bul. Soc. Roy. Ent. Égypte, 26 (1933), No. 1-3, pp. 1-7, figs. 2*).—In this contribution, in continuation of those previously noted (E.S.R., 68, p. 783), a new genus is erected (*Odontothrips*) and 3 species are described as new.

The skeletal motor mechanism of the thorax of the "stink bug", Nezara viridula L., N. S. R. MALOUF (*Bul. Soc. Roy. Ent. Égypte, 25 (1932), No. 4, pp. 161-203, pls. 6; 26 (1933), No. 1-3, p. 120*).—This is a report of an anatomical study of the southern green stinkbug, presented in connection with a list of 21 references to the literature. An appendix is included (p. 120).

Studies on the internal anatomy of the "stink bug", Nezara viridula L., N. S. R. MALOUF (*Bul. Soc. Roy. Ent. Égypte, 26 (1933), No. 1-3, pp. 96-119, pls. 7, fig. 1*).—This is a continuation of the anatomical studies of the southern green stinkbug above noted.

Gnarled stem canker of tea caused by the capsid bug Helopeltis bergrothi Reut., R. LEACH and C. SMEE (*Ann. Appl. Biol., 20 (1933), No. 4, pp. 691-706, pls. 2*).—The authors show that the gnarled stem canker of tea in Nyasaland is caused by the tea mosquito bug *H. bergrothi*. An account is given of the development of the canker from the time that the insect starts feeding. Measurements of cankers found in the field and those caused by different stages of the insect are recorded. Control measures are briefly considered.

A list is given of 18 references to the literature.

Some notes on the genus Rhagovelia with descriptions of a new species (Hemiptera, Veliidae), G. E. GOULD (*Ann. Ent. Soc. Amer., 26 (1933), No. 3, pp. 465-470, pl. 1, fig. 1*).—This contribution from the Indiana Experiment Station presents notes on the broad-shouldered water striders of the family Veliidae. Of the 12 forms noted, 1 is described as representing a new species under the name *R. hungerfordi*.

A study of color and color-variation in Aphis gossypii Glover, R. E. WALL (*Ann. Ent. Soc. Amer., 26 (1933), No. 3, pp. 425-460, pls. 2, figs. 4*).—The author has found extreme color variation to be a constant feature in colonies of the cotton aphid, the variation being chiefly exhibited by the apterous forms which range from light yellow to blackish green. This characteristic is said to be useful in distinguishing the species. The account is presented in connection with a list of 37 references to the literature cited.

Tar distillate emulsions for the control of the black cherry aphid, F. Z. HARTZELL (*New York State Sta. Bul. 637 (1933), pp. 23, fig. 1*).—In experiments conducted with five domestic brands of tar distillate emulsions in three of the principal cherry areas of New York, including the Ontario Plain, Finger Lakes region, and the Hudson Valley during 1932 and 1933, their efficiency was very high, no appreciable bud or twig injury having occurred. The results indicate that the 4 percent concentration of tar distillate emulsion is a practical and economical mixture for the black cherry aphid.

Long spruce gall (Gillettea cooleyi Gill.), E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 73-75, fig. 1*).—A brief description is given of this aphid and the galls formed and means for its control.

The obscure scale on the pecan and its control, H. BAKER (*U.S. Dept. Agr. Circ. 295 (1933), pp. 20, figs. 6*).—Studies of the biology and control of the obscure scale, conducted at the pecan insect laboratory at Shreveport, La., from 1929 to 1932, inclusive, are reported, the details being presented in tabular form. This scale attacks all parts of the pecan tree, developing first on the lower, inner portions of the trees and spreading gradually outward and upward. Limbs up to 3 in. in diameter are most frequently killed by its attacks.

"Parasites, predators, and diseases exert a considerable influence in reducing the numbers of this scale, and in some instances appear to hold infestations in check without the aid of artificial control measures, though artificial control is usually necessary.

"Four percent lubricating oil emulsions have given good control of light infestations of the obscure scale and of those scales not protected by old scale covers, and have proved safe when used during the strictly dormant period. Five percent emulsions have given an increased degree of control but have shown a slightly greater tendency to cause injury. Six percent emulsions have given a satisfactory, but not perfect, control of the heaviest infestations but have caused serious injury in some of the tests in which they have been used. Eight percent emulsions gave excellent control but caused serious injury. Miscible oils, 1 part stock solution to 15 parts water, proved slightly less effective than 4 percent lubricating oil emulsions. Liquid lime-sulfur was ineffective at dilutions as strong as 1 part stock solution to 5 parts water. Applications at any time (early, middle, or late) in the dormant season of the tree were about equally effective. The method by which the several oils used were emulsified did not appear to affect the degree of control produced by them."

The "masked scale" (Chrysomphalus personatus) in Egypt, H. Priesner and M. Hosny (*Bul. Soc. Roy. Ent. Égypte, 25 (1932), No. 3, pp. 92–96, pl. 1, figs. 3*).—An account of a widely distributed coccid having a wide range of host plants which was first found in Egypt in a small garden at Alexandria in 1931.

Pyrethrum controls cabbage worms, R. Hutson (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 100, 101*).—In control work with worms infesting cabbage, especially the cabbage butterfly, pyrethrum dust was found to give better results than the various arsenical mixtures heretofore used as killing agents. It is pointed out that various pyrethrum sprays are also efficient, but that they are not as convenient to apply or as efficient as pyrethrum dust unless used with some spreading or sticking agent such as soap or skim milk. "Repeated trials on cabbage and cauliflower with both commercial and home-made pyrethrum dusts indicate that a dust composed of ground pyrethrum flowers, or the active principle of pyrethrum flowers, mixed 1 part of pyrethrum dust with 2 parts of some inert carrier, such as talc, bentonite, flour, or other bland carrier, furnishes a ready means of controlling cabbage worms when applied at the rate of 25 or 30 lb. per acre. Mixtures such as the above will keep indefinitely if tightly confined. The inclusion of ½ gal. of kerosene in 100 lb. of such dusts seems to aid the effectiveness in an unexplained way, although the term 'activated' is sometimes applied. It is also perfectly plain from the experimental evidence at hand that the admixture of lime or Bordeaux should be done only when the material is to be used at once."

Studies of fluorine compounds for controlling the codling moth, E. J. Newcomer and R. H. Carter (*U.S. Dept. Agr., Tech. Bul. 373 (1933), pp. 24, fig. 1*).—Experiments conducted with fluorine compounds under arid conditions at Yakima, Wash., with a view to securing substitutes for lead arsenate in combating the codling moth are reported upon. The compounds studied appeared to be less toxic than lead arsenate, which may be due in part to lack of adhesiveness. It is pointed out that because of their cheapness larger quantities may be used without increasing the cost, and that the lack of adhesiveness may be overcome by using fish oil sticker or a mineral oil emulsion with them.

"Tests of barium fluosilicate, potassium fluosilicate, and sodium fluoaluminate (cryolite) at the rate of 3 or 4 lb. to 10 gal. of water, plus 1 pt. of fish oil or ¾ gal. of emulsified mineral oil, reduced the wormy fruit in about the same percentage as lead arsenate did at the rate of 2 lb. to 100 gal. of water, without a sticker except in one experiment, and reduced the quantity of stung fruit by a greater percentage.

"Except in some of the tests conducted in 1927, no fruit or foliage injury resulted from any of the experiments. In the limited number of analyses made to determine the residue on the fruit at the time of harvest, the residue from these materials was less than that left by lead arsenate and was as easily removed.

"The fluorine compounds should not be used with lime-sulfur or with spreaders containing lime."

Codling moth control: Experiments at Harcourt, R. T. M. Pescott (*Jour. Dept. Agr. Victoria, 31 (1933), No. 10, pp. 484–489, figs. 6*).—The codling moth experiments during the year were found to confirm the results obtained in earlier years (E.S.R., 67, p. 291) in that the use of white oil emulsion in the spray programs after the two calyx arsenate of lead sprays have been applied results in a more efficient and economical control of the codling moth than where arsenate of lead is used alone in the spray program. Those programs in which oil emulsions were used resulted in an arsenical residue which was below the limit prescribed by law, but this was not the case where lead arsenate was used alone. Lures composed of vinegar solution again proved more effective in trapping the codling moth than other recognized lures. The use of chemically treated bandages this season resulted in a large number of larvae being captured, and these were all destroyed by the chemical used.

Action of entomophytous fungi on the European corn borer (Pyrausta nubilalis Hbn.) [trans. title], C. Toumanoff (*Ann. Parasitol. Humaine et Compar., 11 (1933), No. 2, pp. 129–143, pls. 3*).—The author deals with the infection of the European corn borer by *Aspergillus flavus*, *Beauveria bassiana*, and *Isaria farinosa*.

Food habits of Tineola uterella, J. W. Kea (*Fla. Ent., 17 (1933), No. 4, p. 66*).—This is a brief contribution from the Florida Experiment Station on a moth which has been present in Florida for a number of years and is apparently becoming more abundant, especially in the southern part of the State. It feeds at times upon dried insects and when offered eagerly eats woolen threads and woolen cloth. Numerous complaints of its depredations upon rugs and other woolen fabrics are said to have been received.

The breeding of Ephestia kühniella Zl. in large numbers for experimental work, G. H. Mansbridge (*Ann. Appl. Biol., 20 (1933), No. 4, pp. 771–774*).—A description of the methods employed by the author.

Specifications for mosquito oils and larvicides, J. M. Ginsburg (*New Jersey Stas. Circ. 291 (1933), pp. 4*).—Experiments conducted have shown that fractions of petroleum boiling at from 200° to 550° F. are very toxic to mosquito larvae and pupae, giving a complete kill within 30 min. The higher boiling fractions possess lower toxicity, requiring several hours to kill, meanwhile allowing mature pupae to develop into adults. On the other hand, the low boiling fractions possess high volatility and rapidly evaporate from the surface of the water, whereas the high boiling fractions do not volatilize and only slowly decompose, leaving an oil film on the water for a long time, thus preventing oviposition and hatching of mosquito eggs. A mixture of these fractions in proper proportions produces an oil which is highly toxic to larvae and lasts for 8 days or longer. Such an oil can be readily prepared by mixing low grade kerosene or a similar cheap light fuel oil with various proportions of either heavy distillate fuel oil or crank-case waste oil. Application of the oil may be made with equipment varying from the ordinary hand sprayer to the airplane.

It is pointed out that while petroleum oil is at present the most reliable larvicidal agent on both fresh and salt water, where it cannot be employed due to its poisoning fish and waterfowl and injury to aquatic plants a pyrethrum larvicide has been found satisfactory. This consists of kerosene extract of pyrethrum equal in strength to 20 lb. of pyrethrum flowers to the gallon and liquid coconut soap containing about 40 percent actual soap. In order to apply this larvicide on salt water, powdered skim milk or similar emulsifying agents which do not react with salt water, such as glue and various gums, should be used instead of soap.

Transmission of yellow virus by Culex fatigans Wiedemann, N. C. Davis (*Ann. Ent. Soc. Amer., 26 (1933), No. 3, pp. 491–495*).—In experimental work by the Rockefeller Foundation at Bahia, Brazil, the yellow fever virus was transmitted to rhesus monkeys by the bites of *C. fatigans*. In one of two experiments the intrinsic incubation period was 17 days; in the other, it was from 20 to 23 days. In one lot of mosquitoes, survival of the virus was demonstrated as late as 39 days after the meal on infective blood. The evidence indicates that a great many mosquitoes in the experimental lots were able to free themselves of virus. *C. fatigans* is not an efficient host for yellow fever virus.

Experimental investigations of myiasis of batrachians by Lucilia bufonivora [trans. title], E. Brumpt (*Compt. Rend. Acad. Sci.* [*Paris*], *197 (1933), No. 26, pp. 1777–1779, fig. 1*).—This is a brief account of the experimental infestation of several forms of batrachians by *L. bufonivora*, an important dipterous parasite of the toad *Bufo vulgaris* in Normandie (Normandy).

The synonymy and distribution of Chrysomyia rufifacies (Macq.), an Australian sheep blowfly, F. G. Holdaway (*Bul. Ent. Res., 24 (1933), No. 4, pp. 549–560, figs. 5*).—The author finds in a study of chaetotaxy and the genitalia that the Australian sheep blowfly *C. rufifacies* is distinct from *C. albiceps* Wied., with which it had been considered identical. The synonymy of *C. rufifacies* is given; also the distribution of *C. rufifacies*, *C. albiceps*, and *C. putoria* Wied. The account is presented in connection with a list of 46 references to the literature.

On the bionomics and structure of some dipterous larvae infesting cereals and grasses.—I, Opomyza florum Fabr., I. Thomas (*Ann. Appl. Biol., 20 (1933), No. 4, pp. 707–721, figs. 8*).—The author deals with *O. florum*, a pest of cereals which has been recorded chiefly from Russia. Injury to wheat by the larva occurred on the experimental plats at the University Farm, Cambridge, in 1931 and 1932. "Eggs are laid near sprouting wheat in the autumn; these hatch in the following April and infest the young plants, the central shoot being severed. There are three larval instars and pupation takes place inside the plants in May. Adults emerge in June and live until November. They frequent shaded places and may be caught along hedgerows of clover and sainfoin fields. Early sown winter wheat is more liable to attack than that sown after the end of October. The variety of Old Fashioned II was found to be more resistant to attack than other varieties examined. A description is given of the egg, the larval instars, and the puparium."

On the biology of some species of Longitarsus (Col., Chrysom.) living on ragwort, H. C. F. Newton (*Bul. Ent. Res., 24 (1933), No. 4, pp. 511–520, figs. 11*).—This contribution from the Rothamsted Experimental Station reports briefly upon four species of *Longitarsus* under observation, namely, *L. jacobaeae* Wat., *L. dorsalis* F., *L. succineus* Foudr., and *L. gracilis* Kuts.

Ladybird beetles as predators of the potato psyllid, G. F. Knowlton (*Canad. Ent., 65 (1933), No. 11, pp. 241–243*).—This is a contribution from the Utah Experiment Station reporting observations of the adult convergent lady beetle and other species of the genus *Hippodamia* as enemies of the potato psyllid *Paratrioza cockerelli* (Sulc.). In observations of the convergent lady beetle as many as 74 adult *P. cockerelli* were killed and mostly eaten within a period of 7 consecutive hours by a female beetle. The following day the same female killed and ate an average of about one half of each of 71 adults of this psyllid in 8 consecutive hours, the greatest number eaten during 1 hour being 17.

Changes in the cell contents of wood (xylem parenchyma) and their relationships to the respiration of wood and its resistance to Lyctus attack and to fungal invasion, S. E. Wilson (*Ann. Appl. Biol., 20 (1933), No. 4, pp. 661–690, figs. 11*).—Experimental work has shown that the reserve starch in the sapwood cells of oak, ash, walnut, willow, and other woods is the actual food of powder post beetle larvae (*Lyctus* spp.). Starch depletion by log seasoning is a method of preventing the infestation of timber by *Lyctus* powder post beetles, since starch is proved to be the main food of *Lyctus* larvae. When timber is "converted" soon after felling and then subjected to treatment (e.g., kiln drying or steaming) which kills the cells, the starch remains in the sapwood. Such timber remains liable to *Lyctus* attack since the starch content is not altered by any subsequent (seasoning) treatment. The removal of starch renders sapwood resistant to sap-staining fungi.

The effect of kiln temperatures and air-seasoning on ambrosia insects (pinworms), G. R. Hopping and J. H. Jenkins (*Canad. Dept. Int., Forest Serv. Circ. 38 (1933), pp. 14, figs. 7*).—Studies on the life history of three species of ambrosia beetles, or pinworms, of economic importance in the hemlock forests of British Columbia, namely, *Trypodendron cavifrons* Mannh., *Gnathotrichus sulcatus* Lec., and *Xyleborinus* sp., show that they do not attack healthy living trees or seasoned lumber. They make branching galleries in the sapwood of large limbs and logs which have been cut for a sufficiently long period to produce the sap condition necessary for the growth of the fungus or "ambrosia" upon which the larvae feed. On exposure of the beetles in pieces of western hemlock 3 in. thick all were dead after treatment of 1½ hr. at 160° and 150° F., 2½ hr. at 140°, and 9 hr. at 120°.

It is concluded that air-seasoning, if continued long enough, will eventually eliminate all living ambrosia insects of the species dealt with either by death or by emergence. However, in cases where total destruction of the insects is required in a short period this method cannot be recommended because of the number of variable factors involved in air-seasoning.

Observations on the flight muscles of Sitona weevils, D. J. Jackson (*Ann. Appl. Biol., 20 (1933), No. 4, pp. 731–770, pls. 2, figs. 4*).—This account of the macropterous weevils of the clover root curculio is presented in connection with a list of 32 references to the literature.

[Report of work in apiculture at the Wyoming Station] (*Wyoming Sta. Rpt. 1933, pp. 16–18*).—Work is reported on wintering bees and foulbrood control.

Package bees and American foulbrood, A. P. Sturtevant (*Amer. Bee Jour., 73 (1933), No. 7, pp. 259–261*).—Transmission experiments conducted in 1931 and 1932 have led the author to conclude that when there is a period of 72 hr. or less between the time of making up packages and the time of using them for making new colonies the packages should be held in a cool, dark place for at least 96 hr., particularly if there is any suspicion of American foulbrood infection at the source from which the packages have come.

The differential effect of environmental factors upon Microbracon hebetor Say (Hymenoptera: Braconidae) and its host Ephestia kühniella Zeller (Lepidoptera: Pyralidae), II, N. M. Payne (*Ecol. Monog., 4 (1934), No. 1, pp. 1–46, figs. 4*).—In this second contribution (E.S.R., 70, p. 367) the author reports having found that under certain conditions of temperature and moisture the braconid parasite *M. hebetor* is able to control the Mediterranean flour moth. "The parasite is favored by a shorter life cycle, whereby it can reproduce several times while the host is reproducing once. Since the parasite feeds on the host larva, the relative length of this host stage favors the parasite. The fast strain of host is less susceptible to parasitic attack than the slow one, since the slow one furnishes nourishment for a longer time than does the fast one and thus allows more generations of parasite to develop on it. If the adult parasite emerges when the host is in the egg or the pupal stage, the slow strain has the advantage, since the parasite has to starve longer before it obtains food. Considering the life cycle as a whole, the fast strain is less susceptible to parasitic attack. In certain limiting cases it is possible, however, for the fast strain to be exterminated when the slow one could survive."

The contribution is presented in connection with a five-page list of references to the literature.

The serphoid and chalcidoid parasites of the Hessian fly, A. B. GAHAN (*U.S. Dept. Agr., Misc. Pub. 174 (1933), pp. 148, figs. 32*).—Following a brief discussion of general history and host relationship, the hymenopterous parasites of the Hessian fly of the superfamily Serphoidea and Chalcidoidea to the number of 41 species are described and many illustrated. Of these, 35 are known to parasitize the fly in America, 17 attack it in Europe, and 11 species are common to both continents. Accompanying the descriptions are reviews of the literature and brief summaries of information on hosts and life history, distribution, and importance.

Glypta rufiscutellaris Cresson, an ichneumonid larval parasite of the oriental fruit moth, A. W. CRAWFORD (*New York State Sta. Tech. Bul. 217 (1933), pp. 29, figs. 12*).—The primary larval parasite of the oriental fruit moth here reported upon is said to be of considerable importance as a controlling factor in decreasing its injury, ranking second only to *Macrocentrus ancylivorus* Roh.

Studies of its host relations have shown that a high spring emergence from the ragweed borer (*Epiblema strenuana* Walk.) and a subsequent high parasitism of the oriental fruit moth depend largely on the population level of the ragweed borer. "Even though *G. rufiscutellaris* emerges considerably before the fruit moth, it is capable of living from the time of emergence until a chance for reproduction on the fruit moth presents itself. The eggs of *G. rufiscutellaris* are laid in the body cavity of the host throughout the summer. Only one egg is laid by the female at each thrust of the ovipositor. Descriptions are given of all the stages in the life cycle. There are four larval stages, all of which feed internally, completely consuming the contents within the exoskeleton of the host. Light of longer wave lengths was observed to stimulate copulation. In experimental rearings, the best results were obtained when late first and early second instar oriental fruit moth larvae were exposed to the parasite. The dormant season is passed as a full-grown larva within its cocoon until midwinter, at which time a prepupal form is assumed until spring. In western New York there are normally three generations of the oriental fruit moth, each being parasitized by *G. rufiscutellaris*."

The parasites of Pseudococcus comstocki Kuw., H. COMPERE (*Canad. Ent., 65 (1933), No. 11, pp. 243–247*).—In this contribution from the California Citrus Experiment Station the author describes two new species, *Coccophagus pseudococci*, parasitic on the mealybug *P. comstocki* in China, and *Tropidiophryne flandersi*, reared from a mealybug thought to be this species collected on *Acacia longifolia* in New South Wales.

It is pointed out that this mealybug, which has become abundant in some States east of the Mississippi River, has been found on Monterey pines at Palo Alto, Calif., and is a potential pest of citrus, on which it occurs in Japan.

On Hoplocampa flava L., the plum sawfly, H. W. Miles, I. Thomas, and G. L. Hey (*Ann. Appl. Biol., 20 (1933), No. 4, pp. 722–730, pls. 2, figs. 6*).—This sawfly (*H. flava*) appears to be the species definitely associated with injury to the developing fruits of the plum, being generally distributed over England and likely to be of economic importance where plums and damsons are grown extensively. A description is given of the egg, larval, and adult stages.

The hymenopterous parasites of the British Lepidoptera, C. Morley and W. Rait-Smith (*Roy. Ent. Soc. London, Trans., 81 (1933), No. 2, pp. 133–183*).—The authors present a host list of the hymenopterous parasites of British Lepidoptera arranged by families which has been prepared as an aid to the identification of parasites from known hosts.

Transmission of Rocky Mountain spotted fever by the cayenne tick Amblyomma cajennense [trans. title], E. Brumpt (*Compt. Rend. Soc. Biol. [Paris], 114 (1933), No. 31, pp. 416–419*).—Experiments by L. Monteiro et al. having shown that *A. cajennense* may transmit typhus fever in Sao Paulo, Brazil, the author was led to conduct similar experiments with the Rocky Mountain spotted fever virus. Nymphs attached to and engorged on guinea pigs previously infested through the attachment of *Dermacentor reticulatus* infected the guinea pigs to which they attached as adults or into which a tick emulsion was injected.

A revision of the genus Ostertagia Ransom 1907 [trans. title], I. W. Orloff (*Ann. Parasitol. Humaine et Compar., 11 (1933), No. 2, pp. 96–114, figs. 14*).—The author erects the genus *Camelostrongylus* for *O. mentulata* R. & H. 1909 and the genus *Travassostrongylus* for *O. callis* Trav. 1914 and assigns species of the genus *Ostertagia* to five new subgenera, namely, *Ostertagia* (*Ostertagia*), *O.* (*Grosspiculagia*), *O.* (*Spiculopteragia*), *O.* (*Marshallagia*), and *O.* (*Pseudostertagia*). A list is given of 15 references to the literature.

ANIMAL PRODUCTION

[Experiments with livestock in Arizona] (*Arizona Sta. Rpt. 1933, pp. 33–35, 68, 76–79, 80, figs. 3*).—Data obtained in studies with livestock are reported on the nutritional deficiences of Arizona range forage; the value of three grades of alfalfa hay for fattening steers when fed with hegari silage, cottonseed meal, and ground barley; the destruction of vitamin A in baled alfalfa hay during storage; and the biological efficiency of the proteins of hegari when fed alone and when supplemented with other protein feeds.

Poultry tests yielded information on protein supplements for chicks, the effect of inbreeding and outcrossing on egg production and vigor, the negative value of male birds from high-producing hens for increased egg production and of shade for poultry, the utilization of a local meat meal and manamar, a comparison of various mash feeds, growing poultry under confinement, using Arizona-grown grains for poultry production, battery brooding rations, hen batteries, forced molt, and housing poultry in Arizona.

[Experiments with livestock at the Guam Station] (*Guam Sta. Rpt. 1931–32, pp. 9, 10, 11*).—In tests with livestock information was obtained on rations for milk production, prevention and control of matai tati disease, shelter v. open range for dairy cows, and rations for swine, by C. W. Edwards; and the development of the Guam breed of poultry, by F. B. Leon Guerrero.

[Investigations with livestock by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 83, 84, 87, 88, 89–93, 103, 134–139*).—Data obtained in nutrition studies are reported on synthetic diets for Herbivora, by C. M. McCay, L. A. Maynard, L. L. Madsen, and P. Olafson; the nutritive requirements of deer, by Maynard and J. C. Woodward; trout feeding experiments at the Cortland hatchery, by McCay and A. V. Tunison; the nutritive value of proteins of alfalfa hay and of clover hay, by F. B. Morrison, K. L. Turk, and Maynard.

Tests with livestock yielded information on the protein requirements of the mature work horse, by M. W. Harper; protein requirements of yearling steers, by R. B. Hinman and Morrison; prevention of anemia in suckling pigs, by J. P. Willman, McCay, and B. O. Gormel; a comparison of tankage, menhaden fish meal, and white fish meal as protein supplements for growing and fattening pigs, by Willman, Morrison, and Gormel; methods of fattening western lambs, by Willman and Morrison; the relation of feeding and management to the "stiff lamb" trouble, by Willman, S. A. Asdell, W. T. Grams, and Olafson; and a comparison of various instruments for docking lambs, by Willman.

In poultry studies, results are noted on poultry house ventilation, by F. L. Fairbanks, H. E. Botsford, and J. H. Bruckner; relation of physical condition, age, and production of hens to fertility and hatchability of eggs, by G. O. Hall, J. E. Rice, and E. A. Wright; biological study of the problems of artificial incubation of birds' eggs, by A. L. Romanoff, R. A. Sullivan, and M. Afanasien; protein efficiency and vitamin G potency of common protein supplements used in poultry rations, by H. S. Wilgus, Jr., R. C. Ringrose, and L. C. Norris; the value of corn gluten meal for feeding poultry, by Norris and Ringrose; nutrition of pheasants, by Norris, Ringrose, and G. Bump; the calcium and phosphorus requirements of laying hens, by Norris, G. F. Heuser, Wilgus, and Ringrose; influence of the protein level on the growth of chickens and its relation to subsequent behavior, by Heuser and Norris; methods of feeding pullets for egg production, and feeding early-hatched pullets, both by Heuser and F. E. Andrews; and a method for drying egg white.

[Investigations with livestock at the North Carolina Station] (*North Carolina Sta. Rpt. 1932, pp. 46–50, 51, 52, 55, 56, 59*).—In experiments with swine data were obtained in studies on quality of meat, by E. H. Hostetler, J. O. Halverson, and J. E. Foster; pasture for fattening pigs, the comparative effects of feeding a commercial mineral mixture v. a home-mixed mineral to fattening pigs, and the effects of amount of salt used in the cure and of length of time pork is left in the cure on the palatability and desirability of meat, by Hostetler and R. E. Nance; comparison of menhaden fish meal with 40 percent tankage as supplements to corn for fattening pigs when each was mixed with an equal amount of cottonseed meal, and a comparison of white v. yellow corn for fattening fall farrowed pigs when a mixture of equal amounts of fish meal and cottonseed meal was used as a protein supplement, by Hostetler and Foster.

The beef cattle investigations yielded information on the relative efficiency in production and quality of meat, the carrying capacity of native reeds (*Arundinaria tecta*), and the value of gleanings from corn fields for wintering beef cattle, by Hostetler, Foster, and L. I. Case; the carrying capacity of various crops and farm byproducts in terms of livestock units and the practicability of carrying beef cattle and other livestock as a part of the regular farming program in eastern North Carolina, by Hostetler and Case; methods of pasture development for beef cattle and other livestock—(a) methods and cost of seed bed preparation, (b) adaptation of various pasture grasses, (c) carrying capacity of various pasture plants, (d) fertilization, by Case; the comparative value of corn, wheat, and barley for fattening beef cattle, by Hostetler and Foster; and a study of vitamin A in relation to feeding cottonseed meal and hulls in larger amounts to cattle, by Halverson, F. H. Smith, Foster, and Hostetler.

A study with sheep yielded data on the improvement of eastern North Carolina native ewes and market lambs in both mutton and wool producing qualities, by Foster and Hostetler.

The poultry studies furnished evidence on the effect of animal protein level in developing mash on the growth and sexual maturity of Rhode Island Red pullets, and the effect of feeding of fermented mash on egg production, by C. O. Bollinger; capon production, by N. W. Williams and Bollinger; and vitamin D study of menhaden fish oil, by Halverson and R. S. Dearstyne.

[Experiments with livestock at the South Dakota Station] (*South Dakota Sta. Rpt. 1933, pp. 15, 16, 17, 19, 31–33*).—Data are reported on the value of ground flax and ground soybeans in the production of baby beef, breeding Karakul sheep for fur production, feeding soybeans with corn in an effort to avoid soft pork, the value of ground flaxseed in the production of pork, and fattening summer pigs on South Dakota grains, all by J. W. Wilson.

In poultry work, information was obtained in studies in calcification, by K. W. Franke; and the effect of "alkalied" grain on growing chicks and poultry, feeding values of wheat and wheat byproducts, and comparisons of several lime supplements for laying hens, all by W. C. Tully.

[Experiments with livestock in Wyoming] (*Wyoming Sta. Rpt. 1933, pp. 7–10, 12, 13, 24, 25, 26, 27, 28, 29, 30, 31–33*).—Results are reported on minerals in the winter ration of beef cattle; breeding western ewes for wool and lamb production; a comparison of rations for lambs at the Eden, Worland, Sheridan, and Torrington Substations; rations for fattening hogs at the Gillette and Sheridan Substations; and rations for steers at the Torrington and Worland Substations. The work with poultry resulted in information on the effect of rye and other grains upon egg production and quality, feeding chicks at high altitudes, the use of heavy straw insulation and all-night dim lights in housing laying hens, hatching chicks in incubators at a high altitude, crooked breastbones of turkeys, and rations for poultry at the Lyman and Torrington Substations.

Meat on the farm, parts 1–3, P. F. TROWBRIDGE and A. SEVERSON (*North Dakota Sta. Circs. 47 (1933), pp. 40, figs. 38; 48 (1933), pp. 39, figs. 38; 49 (1933), pp. 19, figs. 24*).—In part 1 of this series, Pork: Slaughtering, Cutting, and Curing, the necessary directions for the home slaughtering of hogs, cutting, and curing of meat, making sausage, lard, and soap, and the utilization of pork byproducts are described. Part 2, Beef: Slaughtering, Cutting, and Curing, deals with the selection of a beef animal for slaughtering, the necessary equipment, and the killing, skinning, dressing, ripening, freezing, and cutting of the beef carcass. Part 3, Lamb: Slaughtering, Cutting, and Curing, considers methods that may be practiced on the farm for the selection of animals for killing, and for slaughtering, cleaning, cutting, and curing lamb.

Part 4 of this series has been noted (E.S.R., 70, p. 374).

The effect of saline and alkaline waters on domestic animals, V. G. HELLER (*Oklahoma Sta. Bul. 217 (1933), pp. 23, figs. 6*).—Experiments under carefully controlled conditions were conducted with rats (E.S.R., 68, p. 797), chickens, hogs, sheep, and cattle to determine the effect of the consumption of waters heavily saturated with sodium, calcium, and magnesium chlorides; calcium, magnesium, and sodium sulfates; and minor quantities of carbonates, bicarbonates, and other ions in smaller amounts upon the health and well-being of the animals.

Animals compelled to drink water sufficiently saturated with these salts were injured. In no case was it found that any animal chose to drink a water that was harmful if good water were accessible. The injurious effect did not depend so much upon the kind as upon the amount of salt present. Little difference was noted if the quantity was made up of a single salt or of a number of salts. The limit of tolerance depended upon the kind of animal, age, season of the year, whether in milk production, etc. An inability to nurse young was noted before any injury to the mother was apparent.

Sheep were more resistant to the effect of such water than cattle, and cattle more so than hogs. Sheep could exist on a 2.5 percent solution of sodium chloride and 2 percent magnesium sulfate. Dry cattle were maintained on a 2 percent sodium chloride solution, but a 1.5 percent total salts should be considered the upper limits. For lactating animals this limit was lower.

Sodium chloride was somewhat less active than calcium chloride, while magnesium chloride was the most injurious of the salts. The alkali solutions were more harmful than the saline waters. Animals could be accustomed to water not possible to consume at first, but milk and egg production decreased during the adjustment period. There was also a limit beyond which no further adjustment was possible. Blood analyses did not reveal any marked changes in the composition of the blood due to the consumption of such waters except that just previous to death some changes did occur in the sodium and chlorine concentrations.

This bulletin was planned to demonstrate under what extreme conditions growth, reproduction, and maintenance were possible if an animal were compelled to use saline water as a sole source of drinking supply.

Fattening steer calves, P. Gerlaugh (*Ohio Sta. Bimo. Bul. 166 (1934), pp. 3-5*).—Continuing this study (E.S.R., 68, p. 513), five lots of 20 calves each, averaging approximately 394 lb. per head, were fed for 252 days. All lots were full-fed shelled corn and the same amount of corn silage and mixed clover and timothy hay. Lots 1, 2, and 3 received a protein supplement made up of equal parts of linseed meal and cottonseed meal, and lots 4 and 5 a supplement consisting of equal parts of linseed meal, cottonseed meal, soybean oil meal, tankage, and minerals. Lots 2 and 5 received 0.5 lb. and lot 3 1 lb. of molasses per head daily.

The average daily gains in the respective lots were 1.9, 2.1, 2.2, 2.1, and 2.2 lb. per head. Molasses increased feed consumption and rate of gain, and there was evidence of increased growth in the molasses-fed calves as compared with the check lot. Lots 2, 3, and 5 were appraised at the same price and returned 56, 54, and 58 ct. per bushel of corn fed. Lots 1 and 4 were fed for an additional month. For the entire 280 days lot 1 gained 1.9 and lot 4 2.1 lb. per head daily. At the end of the first period these lots would have returned 58 and 57 ct. per bushel for the corn fed, but due to a decline in prices during the extra month's feeding actually returned only 49 and 53 ct. per bushel of corn fed. A check on water consumption showed that an increased feed consumption was followed by a like increase in the amount of water consumed.

Relative efficiency and profitableness of three grades of feeder steers, III, P. Gerlaugh and C. W. Gay (*Ohio Sta. Bimo. Bul. 166 (1934), pp. 5-7*).—Continuing this study (E.S.R., 68, p. 76), three lots of 12 steers each of choice, medium, and common grade, respectively, were fed for 224 days on the same ration as previously noted. The average daily gains in the respective lots were 2, 1.9, and 2.1 lb. per head.

The return per bushel of corn fed was 35, 42, and 43 ct. in the respective lots. There was little difference in the ability of the three grades of cattle to convert feed into grain. These results are in close accord with results of the two previous trials.

The sheep enterprise: How to establish and manage the farm flock, W. G. Kammlade (*Illinois Sta. Circ. 415 (1933), pp. 32, figs. 11*).—Suggestions are given in this circular on some of the essential practices in practical sheep raising, based on both experimental work and on the experience of successful sheep producers.

Range sheep production, J. M. Cooper (*U.S. Dept. Agr., Farmers' Bul. 1710 (1933), pp. II+34, figs. 22*).—Sound methods of range sheep production, based largely on experience and results with experimental flocks in the range area, are described. The text discusses the following phases: The development of the range sheep industry, types and breeds of sheep on western ranges, selection of breeding stock, management of range sheep, marketing sheep and wool, and causes of losses in range sheep.

Sheep, farm and station management, E. H. Pearse (*Sydney and London: Pastoral Rev. Pty., [1932], 3. ed., rev. and enl., pp. XIII+534, figs. 165*).—This is a revised and enlarged edition of the treatise previously noted (E.S.R., 64, p. 165).

Results of three years of lamb feeding, A. E. Darlow (*Oklahoma Sta. Bul. 213 (1933), pp. 8*).—A series of lamb feeding tests was conducted during 1930, 1931, and 1932 to determine the comparative value of various feeds grown in Oklahoma for fattening lambs.

Adding cottonseed meal to a ration of corn and alfalfa hay decreased the grain required per unit of gain 5.8 percent, but increased the hay requirement about 10 percent and the rate of gain 11.6 percent. Feeding whole corn with whole alfalfa hay required 7.5 percent more grain and 7 percent less hay per unit of gain than a ration containing cut alfalfa. Cutting or chopping alfalfa hay for feeding with whole wheat reduced the hay required per pound of gain 7.8 percent, but the grain requirement was not affected. When a ration of cane hay, corn, and cottonseed meal was fed, 25 percent more concentrate and 25 percent more hay were required than when alfalfa hay, corn, and cottonseed meal were used. Whole wheat and whole alfalfa hay required about 7 percent more grain and 9 percent less hay per unit of gain than whole corn and alfalfa hay, but the wheat-fed lambs gained 5 percent more per head daily than did the corn-fed lambs. Lambs fed whole wheat and whole alfalfa hay required 10 percent more grain and 13 percent less hay per unit of gain, but gained 12 percent faster than lambs fed ground wheat. When wheat and cowpea hay were fed, it required 5 percent more grain and 5.6 percent more hay per unit of gain than when wheat and alfalfa hay were fed. A ration of Sudan grass hay, cottonseed meal, and wheat needed 35 percent more grain and 11 percent more hay than a ration of wheat and alfalfa hay. Wheat and cut cowpea hay required 21 percent more grain and 5 percent more hay than a lot receiving wheat and whole cowpea hay. Cutting cane hay to feed with corn and enough cottonseed meal to balance the ration slightly increased the feed required per unit of gain and reduced the rate of gain as compared with whole cane hay. There was no material difference in the feed requirements of lambs receiving cut and whole Sudan hay.

Oats as a feed for swine, W. E. Carroll (*Illinois Sta. Circ. 414 (1933), pp. 12*).—The results of tests with oats of various forms fed to different classes of swine are reported. Information on the problems concerned with the use of oats in swine rations is also given.

To date the results have led to the conclusion that oats may be used to replace a large percentage of the corn in the ration of pregnant sows without decreasing the efficiency of the ration. They may also be used, but to a lesser extent, during the suckling period. One third of the ration for growing fattening pigs may consist of oats without reducing the rate of gain made as compared with a corn ration. Grinding oats increased their efficiency, but hulling oats for growing fattening pigs was not as economical as grinding. In no case were oats more economical than corn and a protein supplement as a feed for hogs when they cost more than corn pound for pound.

Value of skim milk for pigs on pasture, V. A. Freeman (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 107–109*).—In a preliminary trial three lots of 14 pigs each, averaging about 67 lb. initial weight, were started on a basal ration of corn self-fed on good rape pasture. In addition the respective lots received 3 lb., 6 lb., and unlimited amounts of sweet skim milk per head daily. The lots made average daily gains of 1.3, 1.4, and 1.5 lb. per head to a final weight of approximately 180 lb. per head. The feed cost per 100 lb. of gain was $3.68, $4.02, and $5.10 in the respective lots. When it was assumed that gains were worth $3.68 per hundredweight, the returns per hundredweight of milk were 25, 17, and 11 ct. in the respective lots.

Market classes and grades of pork carcasses and fresh pork cuts, W. C. Davis, B. F. McCarthy, and J. A. Burgess (*U.S. Dept. Agr. Circ. 288 (1933), pp. 36, pls. 16*).—This circular contains descriptions of the market classes and grades of pork carcasses and fresh pork cuts, the basis for these gradings, and descriptions of the types and uses of pork carcasses and of the grades of fresh cuts for domestic and export trade.

Animal management, 1933 (*London: Govt., 1933, pp. 379, pls. 11, figs. 53*).—This treatise, prepared in the veterinary department of the war office of Great Britain, describes the structure and function of the various parts of the animal body, the points and markings of a horse, stable construction and management, foods and feeding, management of horses and of other work stock, showing, shipping, and the prevention and treatment of sores and diseases.

Biochemistry and biophysics of the developing hen's egg.—II, Influence of composition of air, A. L. and A. J. Romanoff (*[New York] Cornell Sta. Mem. 150 (1933), pp. 36, figs. 19*).—Continuing this investigation (E.S.R., 64, p. 257), a study was made of the influence of various compositions of air, particularly in respect to the content of oxygen and carbon dioxide, on the successive stages of the growth, development, and mortality of chick embryos, and also on the pH of egg albumen and yolk. Eggs from a commercial flock of White Leghorn hens were used. The eggs were incubated in a special electric laboratory incubator (E.S.R., 63, p. 766) in which the amount of CO_2 was admitted in the following amounts: 0.4, 1, 6, 10, 14, 18, and 22 percent.

The results indicated that the unbalanced composition of the air had both a direct and indirect influence on the development of the embryo. Under the direct influence it was found that the growth of the embryo during the first few days of incubation was apparently stimulated by a moderate amount of CO_2. A large amount of CO_2 with a reduced amount of oxygen retarded growth in direct proportion to the amount of CO_2 present. The embryo at this stage was more sensitive to unbalanced air conditions than at later stages. The mortality of the embryo during the early part of incubation was greatly increased by either low or high concentrations of CO_2. The abnormalities within the egg were mostly various malpositions of the embryo.

Among the indirect influences was observed a great change in the pH of the egg constituents, particularly of the albumen. The pH of the albumen during the first week of embryonic growth was in direct relationship to the amount of CO_2 in the incubator. This relationship could be expressed mathematically, using the empirical formula:

$$y=7.83+\frac{(2.945-0.25x)}{(1.3x+1.69)}(\sin 30z-0.5 \sin 60z),$$

in which y is the pH of egg albumen, x the CO_2 concentration, and z age of embryo in days. This relationship between CO_2 concentration and pH of egg albumen is suggested as a method for testing the reliability of incubators and the efficiency of hatching.

The iron and copper content of egg yolk, S. E. Erikson, R. E. Boyden, J. H. Martin, and W. M. Insko, Jr. (*Kentucky Sta. Bul. 342 (1933), pp. 133–148, fig. 1*).—Continuing this study of factors that may affect the nutritive quality of eggs (E.S.R., 69, p. 704), eggs from various lots were broken, the yolks and whites separated, and the yolk analyzed for copper and iron content. A total of 420 yolks was examined for iron and 212 for both iron and copper.

The results of the analyses showed that the addition of 2 percent of cod-liver oil to the basal ration raised the percentage level of both copper and iron values in egg yolk. Direct sunshine increased the copper and iron percentage levels of yolks from hens receiving no cod-liver oil over those of hens receiving sunlight only through ordinary window glass. The level of iron in the yolk of eggs from hens receiving direct sunshine in addition to cod-liver oil was decreased, but the level of copper was raised as compared with the eggs of hens that received sunlight only through ordinary window glass. Hens receiving cod-liver oil only produced eggs showing higher percentage values for iron in the yolk than were produced by hens receiving both sunshine and cod-liver oil, while the latter showed higher values than eggs from hens on open bluegrass range and cod-liver oil. Hens receiving sunlight on grass range and cod-liver oil produced eggs with a copper level 2.5 times greater than did eggs from hens confined without sunshine or cod-liver oil.

A method and the apparatus for the study of permeability of gases through the bird's eggshell, A. L. Romanoff (*Science, 77 (1933), No. 1999, pp. 393, 394, figs. 2*).—In this article from the [New York] Cornell Experiment Station, the author describes an electric apparatus for the direct and accurate measurement of the permeability of the bird's eggshell to various gases.

The role of mineral oil in egg quality preservation, T. L. Swenson and L. H. James (*Amer. Creamery and Poultry Prod. Rev., 76 (1933), No. 19, pp. 618, 619*).—The amount of oil remaining on the surface of eggshells following oil treatment was determined by the U.S.D.A. Bureau of Chemistry and Soils. Eggs were allowed to drain for 3 min. and were then wiped with weighed, dry squares of absorbent cloth, the increase in weight showing the amount of oil absorbed. Determinations were made on eggs treated at atmospheric pressure and by the vacuum-carbon dioxide method at both 110° and 150° F., respectively.

Eggs treated by the vacuum-carbon dioxide method had less oil adhering to the surface than eggs dipped at the atmospheric pressure. Eggs having the greatest amount of adherent oil were no better protected than eggs which took up less oil. A large portion of the oil adhering to the surface of vacuum-treated eggs was taken into the pores. The temperature of dipping had little effect on the amounts of oil adhering to the shell surface. Tests with oils of different physical constants showed little change in the amounts of ether-soluble material on eggshells and membranes before and after storage.

Chick suggestions, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 21 (1933–34), No. 2, pp. 2*).—This account gives useful suggestions on the management and feeding of chicks up to the twenty-fourth week of age.

Sexing baby chicks, K. Masui and J. Hashimoto, trans. by H. Okumura (*Vancouver: Jour. Ptg. Co., Ltd., 1933, pp. 91, pls. 21, figs. 5*).—In addition to describing in minute detail the technic of sexing chicks, the treatise discusses the early history and development of sexing, the anatomy of the sexual organs of the fowl, and the structure of the cloaca and the genital eminence. The economic significance of the early separation of sexes is discussed.

Investigations on the digestibility of the crude fiber of the different kinds of barley by poultry [trans. title], H. Stotz and H. Brüggemann (*Arch. Geflügelk., 7 (1933), No. 7, pp. 202–215; Eng. abs., p. 214*).—Digestion trials with Rhode Island Red hens fed 10 different varieties of barley were conducted at the Institute of Animal Physiology of the Agricultural High School, Berlin. The digestibility of the crude fiber of barley varied widely and depended upon the variety fed. There was no characteristic difference in summer and winter barley. The results suggested that in determining the digestibility of this nutrient of barley for poultry it should be calculated for every variety.

A comparison of fish meal with meat and bone meal for laying ducks, V. K. Tallent (*Harper Adams Util. Poultry Jour., 18 (1932–33), No. 8, pp. 350–353*).—This study at the National Institute of Poultry Husbandry, England, was planned to determine whether fish meal or meat and bone meal was more economical for egg production in ducks.

There was no significant difference in the egg production of ducks receiving fish meal or meat and bone meal, but because of the lower cost of the latter feed it was much more economical. The ducks receiving fish meal produced a greater percentage of first grade eggs.

Fattening young geese on cut sugar beets, molasses mixed feeds, and milk [trans. title], K. E. Ferber and M. Chodziesner (*Arch. Geflügelk., 7 (1933), No. 6, pp. 177–184; Eng. abs., p. 183*).—In a study at the Institute for Feeding Technic, Breslau, Germany, it was found that dried sugar beets could be used to make up a large part of the ration for fattening green geese if skim milk and young clover or alfalfa were also used. A ration of dried sugar beets, wheat bran, and ground oil cake fed to geese on green forage gave satisfactory results. Molasses feeds could also be used when fed with ground oil cake to geese receiving liberal amounts of young clover and alfalfa

The artificial propagation of ring-necked pheasants, E. W. Callenbach and C. A. Hiller (*Pennsylvania Sta. Bul. 299 (1933), pp. 22, figs. 3*).—Continuing this study (E.S.R., 68, p. 369), it was found that the best hatching with ring-necked pheasant eggs was obtained when they were incubated for 18 days at a relatively high humidity in air-agitated or forced-draft incubators. This was followed in efficiency by hatching the eggs in a separate single-deck, sectional, still-air incubator.

The chicks were brooded satisfactorily in colony houses with attached wire-floored sun porches, but after 6 weeks of age they required more room. Battery brooding was not satisfactory because of excessive mortality and poor feather development. Pheasant chicks made better early growth on rations of higher protein content than those used for chicks of the domestic fowl. A ration containing 28 percent protein produced the best growth, feathering, and feed consumption. Feeding by the usual free-choice method was not satisfactory. The use of ordinary commercial meat scrap and fish meal in making up the ration resulted in an appreciable increase in the percentage of slipped tendons. It was felt that the use of a high protein (75 percent) meat scrap would overcome this difficulty.

DAIRY FARMING—DAIRYING

[Dairy studies in Arizona] (*Arizona Sta. Rpt. 1933, pp. 40, 41, fig. 1*).—Results are reported from studies on the effect of maturity of alfalfa on milk production and on bacteria in milk at the time of its reduction in the methylene blue reduction test.

[Experiments with dairy cattle by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 82, 83, 86, 87, 88, 89*).—Investigations with dairy cattle furnished data on the influence of grain mixtures of different fat levels upon milk secretion, by L. A. Maynard, C. M. McCay, H. H. Williams, L. L. Madsen, and R. Melampy; the influence of specific fats on lactation in goats, by Maynard and Williams; dicalcium phosphate as a mineral supplement, by Maynard and K. V. Rottensten; value for dairy cows of early-cut timothy hay fertilized with a nitrogenous fertilizer, by F. B. Morrison, G. W. Salisbury, E. S. Savage, and E. S. Harrison; minimum amount of protein for dairy cows, by Savage, Harrison, and S. H. Work; raising dairy calves on dry concentrate mixtures, by Savage, Harrison, and C. H. Crawford; and pasture improvement studies, by Harrison and D. B. Johnstone-Wallace.

[Investigations with dairy cattle at the North Carolina Station] (*North Carolina Sta. Rpt. 1932, pp. 52, 53*).—In studies with dairy cattle data are reported on dairy pasture studies, by C. D. Grinnells, S. C. Clapp, and H. Coulter; the value of lespedeza as a supplementary pasture, by Grinnells and A. J. Pieters; and the comparative value of alfalfa and lespedeza hay, by Grinnells.

[Experiments with dairy cows and dairy products at the South Dakota Station], T. M. OLSON (*South Dakota Sta. Rpt. 1933, pp. 19, 20, 21–23*).—In tests with dairy cows information was obtained on a comparison of sweetclover, alfalfa, and Sudan grass pastures under South Dakota conditions; alfalfa v. sweetclover hay; crossbreeding experiments; and oat feeding v. roughage for dairy cows.

The dairy products studies yielded results on amino acid titration as a measure of quality in dairy products; variation in the calcium and phosphorus content of cow's milk; ice wells for dairy farms; holding cream raw and pasteurized; the vitamin D content of milk from cows exposed to sunlight, green grass, and no sunlight; and the vitamin D potency of butter.

[Experiments with dairy cattle in Wyoming] (*Wyoming Sta. Rpt. 1933, pp. 10–12, 28*).—Results are reported on grain or no grain for dairy cows, palatability of hay, the milk ration for dairy calves, and roots for dairy cows at the Lyman Substation.

Feeding dairy cows in the Matanuska region, Alaska, W. T. WHITE (*Alaska Stas. Circ. 5 (1933), pp. 10*).—Information on the economical feeding of dairy cattle, based largely on the experience of the stations, is summarized.

Feeds for dairy cattle, J. O. TRETSVEN (*Montana Sta. Bul. 282 (1933), pp. 20*).—The results of a number of feeding tests conducted over a period of years with dairy cattle are reported. Some of these results have been previously noted (E.S.R., 43, p. 68; 64, p. 259).

A review of the feeding tests with sunflower silage led to the conclusion that Mammoth Russian sunflowers could be successfully used for both silage and soiling purposes. Silage made from sunflowers when 30 to 90 percent of the plants were in bloom compared favorably with corn silage made from immature corn. About 3 tons of good sunflower silage were required to replace 1 ton of good legume hay. Adding sunflower silage to a ration of legume hay and grain failed to increase milk production. No objectionable flavors or odors could be detected in the milk when green sunflowers or sunflower silage were fed. Sunflower silage cost less than oat and pea silage, but had a slightly lower feeding value.

Soiling and pasturing trials showed that there was no material increase in milk production when soiling crops consisting mostly of legumes were substituted for good irrigated pasture. Green oats alone was not a good soiling crop. While soiling crops may be practical during hot, dry seasons, they were not economical when compared with good irrigated pastures.

Surplus skim milk may be added to a ration of hay, grain, and silage to good advantage. When used in this manner for producing cows, it had a feeding value about one fifth that of grain.

Calves made large and economical gains when gradually accustomed to self feeding and when a rather bulky grain mixture was used. Self-fed calves ate more grain and less hay than hand-fed calves. The only special merit in self feeding calves was the reduction in labor.

There was little advantage in cutting alfalfa hay for milk cows except for the convenience of feeding, and this was offset by the cost of cutting. It was found that rye could be used to good advantage to make up a large part of the grain rations of milking cows. Beet molasses was a laxative feed, but not objectionably so when fed in small amounts with other feeds. From 2 to 3 lb. of beet molasses could replace a like amount of ground Trebi barley without affecting the quality of the milk or the health of the animal. Diluting molasses and sprinkling over the hay increased the consumption of the hay by growing heifers.

Raising dairy calves by a limited milk feeding plan, E. C. Elting and J. P. LaMaster (*South Carolina Sta. Bul. 293* (*1934*), *pp. 19*, *figs. 9*).—A series of experiments was carried out to determine the minimum age at which a calf could be weaned from milk and the feeds that would grow an animal normally to weaning.

Calves that had been given a good start on whole milk could be completely weaned from milk at 50 days of age for Holsteins and at 60 days for Jersey and Guernsey calves, depending upon the size and the thrift of the calf, and satisfactorily raised on a dry concentrate mixture and hay. While calves so managed slowed up somewhat in growth following weaning, they were approximately normal at 6 mo. of age. Offering warm drinking water following weaning to insure adequate water consumption was of great value up to 90 days of age. When compared with calves fed in the usual manner, it was found that the use of about 150 lb. of whole milk and 170 lb. of grain replaced approximately 2,000 lb. of skim milk up to 6 mo. when the calves had access to good quality hay.

Cottonseed meal proved to be more palatable, had no harmful effect, and promoted larger gains when used in the ration than did fresh meal. Adding skim milk powder to the ration prevented a severe set-back in growth following weaning. A good quality leafy hay was essential to this method of raising calves. The skeletal structure of the calves raised according to this plan was somewhat less dense and the breaking strength of the bone was lower than in calves receiving skim milk to 6 mo. of age.

A study of the length of gestation and service record of dairy cows, C. E. Knoop and C. C. Hayden (*Ohio Sta. Bimo. Bul. 166* (*1934*), *pp. 8–14*, *fig. 1*).—The results reported are based on data compiled from the breeding records of the station from April 1903 to March 15, 1933. The average gestation period for 432 Holstein calves was 278.15±0.154 days. The 219 male calves in this group averaged 278.52±0.223 days and the 213 female calves 277.76±0.211 days. The average length of the gestation for 373 Jersey calves was 278.88±0.176 days. A total of 188 male calves was carried 279.25±0.267

days and 185 female calves 277.55±0.229 days. The 2-year-old heifers of both breeds carried their calves somewhat more than 2.5 days less than 6-year-old cows. The average gestation period for both breeds for both sexes was 278.26±0.117 days.

In a study of the number of services required per conception, it was found that of 379 Holstein pregnancies resulting in normal calvings 1.87 services were required per conception. For 340 pregnancies among Jerseys 1.53 services per conception were required.

Milk-energy formulas for various breeds of cattle, O. R. Overman and W. L. Gaines (*Jour. Agr. Res.* [*U.S.*], *46* (*1933*), *No. 12, pp. 1109–1120, figs. 5*).—The first sentence of the second paragraph of the abstract of this article previously noted (E.S.R., 70, p. 84), should read "Based on fat, protein, and lactose only, the following values in calories per gram were found: Fat, 9.253±0.065; protein, 5.853±0.127; and lactose, 3,693±0.059."

Building better butter quality, H. B. Morrison, J. O. Barkman, and J. A. Britt (*Amer. Creamery and Poultry Prod. Rev.*, *76* (*1933*), *No. 11, pp. 348, 350, 351, figs. 6*).—This is a summary of the results of 437 churnings made in a direct shipper creamery in Kentucky, operating under the 4-day plan of cream grading. The average score of all churnings was 88.9 points. The average percentage of 4-day cream in all churnings was 74.3, and the score of the butter varied according to the amounts of such cream in the churns. Butter made from 4-day cream only scored on the average 2.5 points higher than butter made from cream more than 4 days old. The coefficient of correlation between the amount of 4-day cream in the churnings and the score of butter was 0.5552±0.0223. Based on the average percentage of 4-day cream in the churnings grouped according to score, butter falls into three rather distinct score groups—91 to 90, 89 to 88, and 87.5 to 87.

Species of Escherichia-Aerobacter organisms responsible for some defects in dairy products, W. B. Sarles and B. W. Hammer (*Jour. Bact.*, *25* (*1933*), *No. 5, pp. 461–467*).—The Iowa Experiment Station reports the results of a study of a number of defects in milk and cream due to organisms of the *Escherichia-Aerobacter* group.

Pure cultures of a number of species were isolated from dairy products showing defects apparently due to organisms of this group. Ropiness of milk was found to be due to *E. neapolitana*, to *A. aerogenes*, and to *A. cloacae*. An unusual case of gassiness in milk was due to *A. oxytocum*. Gas in butter cultures and in milk set for cottage cheese and also an unclean odor in milk set for cottage cheese were apparently caused by a variety of *Escherichia-Aerobacter* species.

Higher aging temperatures in the manufacture of ice cream, W. S. Mueller and J. H. Frandsen (*Massachusetts Sta. Bul. 302* (*1933*), *pp. 16, figs. 8*).—In this investigation one portion of a mix was aged at 68° F. and the other portion at 38°. The high temperature was used as an initial aging temperature for 4 hr., followed by the low temperature for 20 hr., and as the only aging temperature for a 4-hr. period. The influence of varying the gelatin content and the mix composition on the magnitude of the effects of aging at a high temperature was also studied.

It was found that when an ice cream mix contained gelatin the efficiency of this ingredient was increased by aging for 4 hr. at 68° regardless of whether or not this was followed by aging at a lower temperature. This increased efficiency was evidenced by an improved body and texture, increased melting resistance, and a slight retardation in rate of whipping when compared with a mix aged at 38°. In a mix containing 14, 10, 15, and 0.4 percent of fat, serum solids, sugar, and gelatin, aging at 68° for 4 hr. increased the efficiency of the gelatin to a point where it could be reduced approximately one fourth without loss in quality of ice cream. Aging a pasteurized mix at 68° for 2, 4, and 6 hr. had no measurable effect on the bacterial growth, pH, or titratable acidity. There was a slight decrease in the viscosity of a mix containing gelatin when aged at 68° for 4 hr., but a great increase in viscosity when this was followed by 20 hr. of aging at 38°. It was not possible to correlate the effects of high-temperature aging with basic viscosity values. High-temperature aging had no appreciable effect on the consistency and whipping properties of the mix nor on the melting resistance, body, and texture of the finished ice cream when the mix contained no gelatin or other stabilizer. When a mix containing the right amount of gelatin for low-temperature aging was aged at 68° for 4 hr., excessive retardation in melting and a curdled appearance resulted.

How to make fancy ice cream, P. S. LUCAS (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 101–107, figs. 6*).—Directions for making special designs of ice cream, including bricks, cakes, pies, and various fancy molds, are presented.

VETERINARY MEDICINE

[Report of work in animal pathology by the Arizona Station] (*Arizona Sta. Rpt. 1933, pp. 36, 37, 40, 41, 79, 80*).—Work under way relating to animal pathology (E.S.R., 68, p. 810) includes that with a colon bacillus infection of sheep with diphtheroid streptococci present, poisonous plants, infectious abortion in dairy cattle, pullorum disease control, and ulcerated gizzards.

[Report of animal parasites at the Guam Station] (*Guam Sta. Rpt. 1931–32, p. 10*).—Brief reference is made (E.S.R., 66, p. 472) to the value of carbon tetrachloride in the treatment of stomach worms (*Haemonchus contortus*) and liver flukes (*Fasciola hepatica*) and the spraying of tick-infested cattle with an arsenical solution.

[Work with diseases and parasitology of livestock by the North Carolina Station] (*North Carolina Sta. Rpt. 1932, pp. 50, 51, 52, 53, 57–59*).—The work of the year is briefly referred to (E.S.R., 68, p. 526) under the headings of the cause and cure of emaciation among cattle, by L. I. Case in cooperation with the U.S.D.A. Bureau of Animal Industry; bovine infectious abortion, by C. D. Grinnells, W. Moore, and L. J. Faulhaber; the practicability of controlling stomach worm infestation in lambs by sanitary measures and the effect of drenching for stomach worms on the growth and general health of lambs, both by E. H. Hostetler and J. E. Foster; pathological hematology of the fowl, by R. S. Dearstyne, F. W. Cook, and J. E. Kelly; and investigation of septicemic diseases among fowls in North Carolina, by Dearstyne and R. E. Greaves.

[Report of work in animal pathology and parasitology at the South Dakota Station] (*South Dakota Sta. Rpt. 1933, pp. 17, 18, 19, 20, 30, 31, 35*).—Brief reference is made to work (E.S.R., 68, p. 811) with oil of chenopodium for the treatment of pigs with ascarids, by J. W. Wilson and F. J. LeBlanc; alkali disease, by K. W. Franke; mastitis in cows, by T. M. Olson; and hemorrhagic septicemia, by C. C. Lipp.

[Report of work with diseases and parasites of livestock by the Wyoming Station] (*Wyoming Sta. Rpt. 1933, pp. 19, 20, 21, 22*).—Brief reference is made to work with stiff lambs, calf diphtheria, and life histories of sheep parasites.

[The third report of the director of the Institute of Animal Pathology, University of Cambridge, 1932–33] (*Cambridge Univ., Inst. Anim. Path. Rpt. Dir., 3 (1932–33), pp. VI+301, pls. 23, figs. 6*).—The contributions presented in this third report (E.S.R., 69, p. 104) are as follows: Contagious Pustular Dermatitis, by R. E. Glover (pp. 1–18); The Diagnosis of *Bacterium abortus ovis* Infection by Agglutination, by T. J. Bosworth (pp. 19–32); A Defective Condition of the Bones of Sheep in Certain Areas, by T. J. Bosworth and J. Stewart (pp. 33–45); The Relationship of "*Bacillus ovitoxicus*" (Bennetts) to the *Clostridium welchii* Group, by A. J. Wilsdon (pp. 46–51); A Note on the Preservation of Complement, by R. E. Glover (pp. 52–57); The Effects of Nematode Infestations on the Metabolism of the Host—Part I, Metabolism Experiments (pp. 58–76), and Part II, The Isolation of a Substance Capable of Inhibiting Enzyme Action (pp. 77–86), both by J. Stewart, and Part III, The Effects of Nematode Infestations on Mineral Metabolism, by G. D. Shearer and J. Stewart (pp. 87–129); The Colorimetric Estimation of Magnesium in Bones by a Modification of the Denis Method (pp. 130–134) and The Importance of Assessing the Effects of Salivary Secretion in the Interpretation of the Results of Metabolism and Mineral Balance Experiments (pp. 135–155), both by M. C. Franklin; A Note on the Mineral Composition of the Blood Serum of the Horse and the Pig, by W. G. Robinson (pp. 156–158); Some Observations on Several Outbreaks of So-Called Lactation Tetany in Cattle, by F. Blakemore and J. Stewart (pp. 159–168); Yew Poisoning in Domestic Animals, by J. A. Nicholson (pp. 169–199); A Study on Tuberculin with Special Reference to the Double Intradermal Test, by R. E. Glover (pp. 200–226); Comparative Field Trials of a Synthetic and a Standard Tuberculin, by J. B. Buxton and R. E. Glover (pp. 227–232); The Preparation of a Synthetic Johnin, by R. E. Glover (pp. 233–236); The Cultivation of Infective Nematode Larvae on Cultures of *Bacillus coli*, by G. Lapage (pp. 237–271); *Onchocerca cervicalis* (Railliet and Henry 1910) and Its Development in *Culicoides nubeculosus* Mg. (pp. 272–284) and The Occurrence of *Onchocerca cervicalis* in Cases of Fistulous Withers and Poll Evil (pp. 285–297), both by J. S. Steward; and A Preliminary Note on the Eradication from Pastures of Some Plants Poisonous to Livestock, by J. Stewart and C. W. B. Wright (pp. 298–301).

[Contributions on animal pathology] (*Arch. Wiss. u. Prakt. Tierheilk., 64 (1931), Nos. 1, pp. 1–88, figs. 18; 2, pp. 93–179, figs. 30; 3, pp. 181–278, figs. 4; 64 (1932), Nos. 4, pp. 281–372, figs. 14; 5, pp. 373–467, figs. 24; 6, pp. 469–550, figs. 13*).—The contributions presented (E.S.R., 70, p. 91) include the following: The Occurrence and the Significance of the So-Called "Continuous Excreters" and "Carriers" of Gelbe Galt (Chronic Streptococcic Mastitis of Cattle), by M. Seelemann and A. Hadenfeldt (pp. 1–16); Inoculation of Fowl Pox Infected Fowls with Pigeon Pox Virus (pp. 17–19) and Vaccination of the Fowl with Pigeon Pox Virus (pp. 20–28), both by K. Bierbaum, E. Eberbeck, and W. Kayser; Carcinoma Solidum of the Urinary Bladder of a Horse with Nonspecific Tuberculosis Deviation of Complement, by W. Rüscher (pp. 29–34); The Roentgen Epilations and Erythema-Producing Doses for the Skin of the Dog, by A. Pommer and W. Mähling (pp. 35–60); The Specificity and Therapeutic Action of Sera against Gaseous Gangrene, by J. Witte and J. Schaaf (pp. 61–82); Remarks on the Contribution "The Pathology of Hog Cholera" of Dr. Eberbeck [E.S.R., 70, p. 92], by Waldmann (p. 83); Reply to the Paper "The Pathology of Hog Cholera" of Dr. Eberbeck [E.S.R., 70 p. 92], by Röhrer (pp. 84, 85), with an answer to the two papers by E. Eberbeck (pp. 86, 87), and concluding words by Waldmann (p. 88) and by E. Eberbeck (p. 88); Investigations of the Secretion of the Parotids of Young and Grown Goats, by A. Trautmann and H. Albrecht (pp. 93–104); The Etiological Relation of Infectious Catarrhal Fever of Cattle to Borna Disease of the Horse and Sheep (pp. 105–115) and Protective Inoculation and the Incubation Period of Borna Disease (pp. 116–124), both by W. Zwick and J. Witte; Histological

Investigations of Hog Cholera—III, Alteration of the Spleen in Acute Cases, with Particular Reference to Splenic Infarcts, by H. Röhrer (pp. 125–143) (E.S.R., 69, p. 710); A Contribution to Fluorosis of Cattle, by P. Luy and E. Thormählen (pp. 144–151); Bone Marrow and Lymph Nodes—A Contribution to Their Functional Approximation as Filters and Protectors, Particularly in Tuberculosis, by P. Cohrs (pp. 152–159); Coccidiosis of Cats in Russia (U.S.S.R.), by W. L. Yakimoff and E. F. Rastegaïeff (pp. 160–168); Narcosis of the Dog through Intratracheal Insufflation of Ether with Avertin, by R. Völker (pp. 169–179); Studies of the Pathological Anatomy and Pathogenesis of Tuberculosis of the Domestic Animals—VI, The Tuberculosis of Carnivora, by K. Nieberle and G. Pallaske (pp. 181–207) (E.S.R., 69, p. 580); The Disinfecting Action of Caustic Soda Solution [Soda Lye] in Hog Cholera, by R. Helm and W. Wedemann (pp. 208–225); Clinical Examinations of Doped Horses, by K. Neumann-Kleinpaul and W. Rüscher (pp. 226–234); The Neukla-Ophthalmic Lens, by K. Neumann-Kleinpaul (p. 235); The Histological Diagnosis of Hog Cholera, by Lüttschwager (pp. 236–244); Moon Blindness of Horses in the Light of Recent Investigations, by W. Gmelin (pp. 245–254); The Part of the Antestomach of One-Cavity Stomachs in the Utilization of Carbohydrates, Based on Tests with White Rats, by W. Lenkeit (pp. 255–260); Experiments with Avertin as a Narcotic for the Horse, by W. Bolz and A. Borchers (pp. 261–278); The Mixed Form of Ventricular Extrasystole Arrhythmia and Sinus Arrhythmia in the Horse, by J. Krinitzin and T. T. Philippoff (pp. 281–299); Studies on the Control of Streptococcic Mastitis of Cattle: The Influence of Irritants on Chronic Catarrhal Streptococcic Mastitis, by W. Steck (pp. 300–328); Has the Transplantation of the Testes into Sexually Mature Sows an Influence on the Oestrous Cycle and Are Changes Produced in the Ovaries and the Uterus? by K. Schouppé and A. Stella (pp. 329–344); The Gestation Period and Conception in Guinea Pigs, by H. Beuchelt (pp. 345–349); Sources of Error in the Measurement of the Blood Pressure of the Horse, by B. Branchini (pp. 350–361); Two Cases of Enlarged Harder's Glands of Both Eyes in the Dog, by S. v. Gajewski (pp. 362–365); Measurement of Chronaxia in the Horse (with Regard to the Question of Doping), by W. Hornung (pp. 366–372); The Diagnostic Value of Tonoszillograms in Investigations of the Circulation of the Horse, by K. Neumann-Kleinpaul and W. Zieger (pp. 373–390); The Synthetic Production of New Anthelmintics and Their Pharmacological Evaluation: A Contribution to the Knowledge of the Relation between Chemical Constitution and Vermifuge Action in the Santonin Group—I, Chemical Part, by A. Gluschke (pp. 391–413); Investigations of the Serological Diagnosis of Tuberculosis of the Bovine—IV, Sensitiveness to Tuberculin and Specific Antibody Formation, by K. Beller (pp. 414–431) (E.S.R., 69, p. 710); The Course of Hog Cholera Encephalitis and Encephalitis of Canine Distemper, by O. Seifried (pp. 432–443); Studies of the Possibility of Interrupting and Shortening General Narcosis by Use of Oxygen, by K. Richter (pp. 444–456); Experiments and Observations on Dairy Cows in the Course of Streptococcic Mastitis Investigations—I, Infection and Transmission Experiments, by M. Seelemann and K. Siemonsen (pp. 457–467); The Effect of Some Anthelmintics on the Fowl, by H. Ohmes (pp. 469–483); Does the Ingestion of Ovaries without Corpora Lutea Produce Alterations in Gonads of the Cock and the Boar? by J. Pittermann and K. Schouppé (pp. 484–502); A Cystoscope for Large Animals, by K. Neumann-Kleinpaul (p. 503); Cystoscopy in the Mare, by K. Neumann-Kleinpaul and E. Gerant (pp. 504–509); Isoagglutination and Blood Groups in Cattle, by O. Hofferber and S. G. Winter (pp. 510–517); Further Investigations on Blood Groups of Equines and Their Hereditary Transmission, by S. Schermer, O. Hofferber, and A. Kaempffer (pp. 518–529);

Experiments and Observations on Dairy Cows in the Course of Streptococcic Mastitis Investigations—II, A Contribution to the Question of the Value of the So-Called Stripping Method, by M. Seelemann (pp. 530–535) (see above); The Effect of Intravenously Administered Calcium on the Heart and Lungs as Determined by Experiments with Cattle, by L. Seekles, B. Sjollema, and F. C. van der Kaay (pp. 536–546); and The Thyroid Gland of Wild and Domestic Swine and the Varying Rhythm in Its Action, by G. Hermann (pp. 547–550).

[Reports of work in animal pathology in the Union of South Africa] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 1 (1933), No. 2, pp. 411–417, figs. 4; 439–455; 459–526, figs. 32; 631–645, figs. 12*).—The contributions presented (E.S.R., 70, p. 382) include the following: Blood Parasites of Game in Zululand—Further Report, by W. O. Neitz (pp. 411–417) (E.S.R., 67, p. 70); *Psilocaulon absimile* N. E. Br. as a Stock Poison—I, Determination of Oxalic, Malic, Tartaric Acids, etc., by C. Rimington and D. G. Steyn (pp. 439–455); Studies on the Photosensitisation of Animals in South Africa—I, The Action of Various Fluorescent Dyestuffs, by J. I. Quin (pp. 459–468); II, The Presence of a Lethal Factor in Certain Members of the Plant Genus *Tribulus*, by E. Rimington and J. I. Quin (pp. 469–489); and III, The Photodynamic Action of *Hypericum ethiopicum* var. *glaucescens* Sond. and *Hypericum leucoptychodes* (Syn. *H. lanceolatum* Lam.) (pp. 491–496), IV, The Toxicity of *Lopholaena coriifolia* (Harv.) Phill. & C. A. Sm. (=*L. randii* sp. Moore) (pp. 497–499), V, The Toxicity of *Lippia rehmanni* (Pears) and *Lippia pretoriensis* (Pears) (pp. 501–504), and VI, The Effect of Surgical Obstruction of the Normal Bile Flow (pp. 505–526), all by J. I. Quin; Keratosis of the Skin in Cattle, by H. H. Curson (pp. 631, 632); Anatomical Studies No. 38: On an Urethral Diverticulum in a Kid, by H. H. Curson and A. R. Thiel (pp. 633–635); and Anatomical Studies No. 39: A Congenital Meningeal Lipoma in a Sheep (pp. 637–639) and Anatomical Studies No. 40: On Two Anomalies Associated with the 1st Branchial Arch (pp. 641–645), both by H. H. Curson.

Abridged report of the director of veterinary research for the year 1932, D. A. LAWRENCE (*South. Rhodesia, Dir. Vet. Res. Abridged Rpt., 1932, pp. 6*).—In this report (E.S.R., 70, p. 675) research work briefly reported includes that with foot-and-mouth disease—its occurrence in guinea pigs, pigs, sheep, and in the native population; horse sickness; red water and gall sickness; trypanosomiasis; and poultry diseases.

Some blood chemical findings and their interpretations in diseases of animals, J. L. BOLLMAN and C. F. SCHLOTTHAUER (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 2, pp. 151–162*).—A few examples are cited in which the authors noted changes in the chemical constituents of the blood that are related indirectly to certain types of abnormalities and disease.

Influence of high frequency displacement currents on bacteria, F. W. FABIAN and H. T. GRAHAM (*Jour. Infect. Diseases, 53 (1933), No. 1, pp. 76–88, figs. 7; abs. in Mich. Sta. Quart. Bul., 16 (1933), No. 2, p. 115*).—Following a review of the literature presented in connection with 24 references, a report is made of studies of the influence of high frequency displacement currents on bacteria by placing them in a combination cooler and condenser and exposing to displacement currents of 7.5, 10, and 15 megacycles.

It was found that in a high frequency displacement current of 10 megacycles and an intensity of 0.08 a the number of colon bacilli increased nearly 300 percent during a period of 3 hr. When the intensity of the displacement current was increased approximately 10 times, the lethal effect of the current became evident. Of the three frequencies studied, 10 megacycles was found to be the most effective and 7.5 megacycles the least effective, while 15 megacycles occupied an intermediate position with respect to a killing action on bacteria. The high frequency displacement currents produced a regular order of death in bacteria. When the logarithm of the number of bacteria surviving at regular intervals was plotted against time, a typical survivor curve resulted.

[Work with poisonous pasture plants at the Wyoming Station] (*Wyoming Sta. Rpt. 1933, pp. 14, 15*).—Reference is made (E.S.R., 68, p. 811) to studies, not previously reported, of vetches and goldenrod.

Determination of the phenol coefficient of disinfectants by the cover-slip method, V. and E. JENSEN (*Jour. Hyg. [London], 33 (1933), No. 4, pp. 485–494*).—Following a brief introduction in which the literature is referred to, objections to the Rideal-Walker method, in which *B[acillus] typhosus* was employed, are considered, followed by a report of studies of the cover-slip method. The authors have altered the original technic of the cover-slip method so that it can be employed for comparison of the disinfecting power of different substances. It is said to offer the following advantages: (1) Employment of *Micrococcus aureus* as test organism; (2) drying of the bacteria on cover-slips, which allows (3) washing for removal of the disinfectant prior to the (4) transplant in veal broth; and (5) test time of 2 min., which simplifies the tests. *M. aureus* is employed because its resistance is relatively great, corresponding to that of the sporeless bacteria encountered everywhere, and the result gives a more accurate expression of the practical serviceability of the disinfectant in question. This is the ratio between the highest dilution of disinfectant divided by the highest dilution of phenol solution that can kill *M. aureus* in 2 min.

The contribution concludes with a list of 24 disinfectants having coefficients higher than phenol and a list of 13 disinfectants with phenol coefficients less than 1.

Deer as carriers of anaplasmosis, W. H. BOYNTON and G. M. WOODS (*Science, 78 (1933), No. 2033, pp. 559, 560*).—Experiments reported have shown certain deer to be carriers of *Anaplasma.* Since deer in the wild state may harbor several species of ticks, some of which are known to be vectors of *Anaplasma,* it appears that deer may be a potential source of anaplasmosis.

A new method of immunization against anthrax, A. EICHHORN and B. M. LYON (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 2, pp. 225–232*).—The authors conclude that a new type of vaccine devised by M. Mazzucchi[1] in Italy, to which the trade name Carbozoo was applied, possesses all the essentials and advantages of an ideal anthrax vaccine.

The histopathology of two cases of colibacillosis, M. W. EMMEL (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 2, pp. 254, 255*).—This contribution from the Florida Experiment Station records two cases of colibacillosis, the histopathology of which was quite similar.

A new intermediate host for Fascioloides magna (Bassi 1878) Ward 1917, W. H. KRULL (*Science, 78 (1933), No. 2031, pp. 508, 509*).—In addition to the snails *Fossaria modicella rustica* and *Pseudosuccinea columella,* previously found by the author to serve as intermediate hosts for the large American fluke (*F. magna*), an important parasite of cattle as previously described by Sinitsin (E.S.R., 64, p. 251), the author reports having found a third snail, *Fossaria modicella,* to serve as a satisfactory intermediate host. The time required for the completion of the intramolluscan phase of the life cycle of *F. magna* was 58 days. In addition to these snail hosts laboratory-raised *Galba bulimoides techella* have been infected with miracidia of *F. magna,* and the development of the larval forms has been studied. The time required for the complete intramolluscan development was 60 days.

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[1] Clin. Vet. [Milano], 54 (1931), No. 8, pp. 577–580.

The distribution of the known intermediate hosts of *F. magna* is recorded.

[Mastitis studies at the New York State Station] (*New York State Sta. Rpt. 1933, pp. 21–24*).—Brief reference is made to studies of the detection, transmission, and control of the organisms causing mastitis, bulletins relating to which have been noted (E.S.R., 69, p. 715).

A study of the brom-thymol-blue reaction in freshly drawn milk, C. S. Bryan (*Amer. Jour. Pub. Health, 23 (1933), No. 7, pp. 721–724; abs. in Michigan Sta. Quart. Bul., 16 (1933), No. 2, p. 116*).—This contribution reports upon the detection of mastitis infection through use of bromothymol blue reactions as obtained under three conditions, namely, the normal or physiological variation of the pH of milk of mastitis free animals, the constancy of positive reactions in naturally infected animals, and the variation from a negative reaction of noninfected animals that are present in an infected herd.

The results indicate that there are normal physiological factors that are responsible for a variation in the pH of freshly drawn milk. The test cannot be used alone to detect cases of mastitis, since positive reactions were obtained in animals that were always free of mastitis; the work of Hucker et al. (E.S.R., 68, p. 530; 69, p. 428) was confirmed, indicating that a negative reaction does not assure freedom from mastitis. The bromothymol blue reaction is deemed of value as an aid in determining relative disease or freedom of a herd from mastitis. If a large number of positive reactions are obtained, it is a good indication that something is wrong, but it does not detect individual cases.

Studies on the antigenic substances of Clostridium parabotulinum, II, J. B. Gunnison (*Jour. Immunol., 26 (1934), No. 1, pp. 17–24*).—In the studies reported the author found that "extracts of toxic cultures of *C. parabotulinum* prepared by the freezing and thawing of young washed cultures contained both protein and carbohydrate but were not antigenic. These extracts reacted specifically in precipitin tests with antiserums produced by the inoculation of intact organisms. An extract prepared from a strain of *C. parabotulinum* type B which had lost its toxicity was antigenic. This extract stimulated the formation of precipitins which were specific for the toxicologic type but not for the groups within the type."

The effect of various temperatures on the eggs and larvae of Strongyloides, J. M. Cordi and G. F. Otto (*Amer. Jour. Hyg., 19 (1934), No. 1, pp. 103–114, fig. 1*).—In experiments conducted in which *S. fülleborni* Linst. was employed, it was found that "in fecal-charcoal cultures the optimum temperatures for development were 23° to 30° C., hatching occurring in 6 to 10 hr., free-living adults in 2 to 3 days, and infective larvae in 3 to 4 days. Development of the free-living cycle though completed was retarded at 15° to 16°. At 10° to 11° and 37° to 40° only a few worms completed the free-living cycle, the rate being slowed in the former case and accelerated in the latter. Hatching but no further development occurred at 40° to 43°, but above 43° every stage was killed quickly."

It is pointed out that *S. fülleborni* is so closely related to *S. stercoralis* that the findings are probably almost directly transferable to the latter species.

Production of fatal infestations in rabbits with Trichostrongylus calcaratus (Nematoda), M. P. Sarles (*Amer. Jour. Hyg., 19 (1934), No. 1, pp. 86–102, figs. 5*).—A report upon experiments in which laboratory animals were infected with *T. calcaratus* Rans. larvae in single doses of different sizes and with increasing weekly doses.

Cultivation of Trichomonas bovis, K. Gehring and C. Murray (*Cornell Vet., 23 (1933), No. 4, pp. 335–343, figs. 6*).—Following an introduction and consideration of its morphology, the authors report upon cultivation studies of *T. bovis* of Riedmüller (E.S.R., 69, p. 712). This form appears to differ from the human trichomonads, particularly the intestinal forms, in its relation to bacteria, it apparently being unable to ingest them.

The comparative value of tuberculoprotein (MA 100) and Old Tuberculin, with especial reference to sensitization, J. D. ARONSON and R. V. NICHOLAS (*Jour. Immunol.*, *25* (*1933*), *No. 6*, *pp. 483–499*).—The results obtained in comparative tests conducted with "small amounts of freshly diluted Old Tuberculin and tuberculoprotein (MA 100) show a close agreement, but with larger amounts a larger percentage reacted to the Old Tuberculin than to tuberculoprotein (MA 100). When those who failed to react to Old Tuberculin and to tuberculoprotein (MA 100) were retested approximately three months later, a small percentage reacted to the Old Tuberculin but a larger percentage reacted to tuberculoprotein (MA 100). In a high percentage of those retested with tuberculoprotein (MA 100) evidence of sensitization was given by the appearance of the specific inflammatory reaction (Arthus phenomenon) at the site of injection."

Acetonemia, and acetonemia with parturient paresis (atypical milk fever), C. E. HAYDEN, M. G. FINCHER, and J. SAMPSON (*Cornell Vet.*, *23* (*1933*), *No. 4*, *pp. 368–376*).—Nine cases studied at the New York State Veterinary College are here reported. The data obtained for the blood and urine ketones in several cases have led to the conclusion that there is little if any evidence to show that these particular cases were acetonemia or acetonemia with milk fever.

The classification of the Brucella group: A systematic study, G. S. WILSON (*Jour. Hyg.* [*London*], *33* (*1933*), *No. 4*, *pp. 516–541*).—The author concludes from the studies here reported, presented in connection with a list of 45 references to the literature, that "besides the existence of three main groups—bovine abortus, porcine abortus, and melitensis—with their subsidiary rough para-abortus and paramelitensis derivatives, there exist within each group a number of subgroups containing transitional strains, which frequently are associated with some particular geographical location. The suggestion is that members of the *Brucella* group are relatively labile and respond readily to environmental changes. How far this peculiar lability is responsible for their power to adapt themselves to a number of different hosts and for their varying pathogenicity is for the future to decide.

"In view of the existence of numerous subgroups, it is unjustifiable, in the classification of individual *Brucella* strains, to rely on any single method of examination. Every strain should, if possible, be examined for CO_2 sensitivity for H_2S formation, for growth in the presence of thionine, basic fuchsin, methyl violet, and pyronine, and for antigenic structure. If reliance is placed on one or two methods only, some strains are bound to be classified wrongly and erroneous conclusions drawn as to the pathogenicity of the group to which they are allocated."

A study of the Brucella abortus agglutination titres of the various species of farm animals in Maryland, L. J. POELMA, C. L. EVERSON, A. L. BRUECKNER, and E. M. PICKENS (*Cornell Vet.*, *23* (*1933*), *No. 4*, *pp. 344–347*).—A review of the literature and the studies here reported have led to the conclusion that the horse, mule, hog, sheep, goat, dog, cat, and fowl may react to the agglutination test when employing *B. abortus* antigen. "The number of positive and suspicious reactions in the horses and hogs would indicate that *Brucella* infection has not become wide-spread in these species in the State of Maryland. The data obtained from the small number of mule sera examined indicate the great need for further study of the incidence of *Brucella* infection in these animals. The data on goats, dogs, and cats are too meager to warrant deductions. The findings on sheep and fowl would indicate the presence of very little or no *Brucella* infection in these species in the State of Maryland."

The portals of entry of Brucella abortus in guinea pigs, C. L. Everson, L. J. Poelma, A. L. Brueckner, and E. M. Pickens (*Cornell Vet., 23 (1933), No. 4, pp. 325–334*).—In experimental work conducted at College Park, Md., the authors found the feeding of the porcine and bovine strains of *B. abortus* to result in infection in 4 of the 5 guinea pigs used in each group. "After placing the bovine strain of *B. abortus* in the eye, 7 of the 8 guinea pigs used became infected. Of those pigs which received the porcine strain, 4 of the 5 developed agglutinins for *B. abortus*. In the experiment in which wound exposure was employed, all of the guinea pigs in the two groups which received the bovine strain developed infection. Eight of the 9 pigs used in the porcine group developed infection. Infection was produced in 9 of 11 guinea pigs which received the bovine strain of *B. abortus* on the scarified skin. Nine pigs received the porcine strain in the same manner, and they all became infected. A total of 23 pigs each received a drop of suspension of the bovine strain of *B. abortus* on the bald spots back of the ears. Of this group, only 1 pig became infected. Each of 22 guinea pigs likewise received a drop of suspension of the porcine strain of *B. abortus* on the bald spots back of the ears. In this group 11 pigs developed agglutinins for *B. abortus* antigen. All of the experimental animals exposed to *B. abortus* in the nose, urethra, vagina, and rectum became infected."

It thus appears that the mouth, the eye, the nose, urethra, vagina, rectum, incisions, scarified skin, and unabraded skin may serve as portals of entry in establishing infection in guinea pigs with the bovine and porcine strains of *B. abortus*.

Brucella abortus and the hygromas of bovines [trans. title], H. Magnusson (*Rev. Gén. Méd. Vét., 42 (1933), No. 500, pp. 465–485, figs. 2*).—The author finds in work in Sweden that the blood of bovine carriers of hygromas contains infectious abortion agglutinins that are largely lacking from the blood of bovines not thus affected. Of 203 with hygromas 39 percent reacted to the agglutination test for the abortion bacillus compared with 12 percent of 1,055 noncarriers from the same region. It is thought that the abortion bacillus is not the primary cause of the hygroma.

The eradication of contagious abortion: A Northumbrian experiment, W. L. Stewart and C. H. Westwater (*Vet. Jour., 89 (1933), No. 12, pp. 536–544*).—This is a report upon control work with a commercial herd of about 60 animals in the north of England in which infectious abortion was eradicated within a period of about 6 mo. through monthly testing and the removal of all positive and doubtful reactors, the herd having been free from infection for 32 mo. It appears that the general and breeding health of the herd has been much better than prior to the eradication of abortion.

A practical interpretation of the scientific evidence on controversial points in the control of Bang's disease, C. P. Fitch and C. R. Donham (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 2, pp. 168–183*).—In this contribution from the Minnesota Experiment Station the authors state their position on certain controversial points relating to control of infectious abortion, summarized as follows:

"In our judgment it is wrong to consider all reactions in the 1:25 dilution or even all incomplete reactions in the 1:50 dilution as suspicious. We do not object to the use of the 1:25 dilution in routine diagnosis work, but it should be used with considerable discretion. We believe that an animal should show a completely positive agglutination reaction in the 1:100 dilution or above before being diagnosed positive. The evidence presented indicates that Bang's disease is much less prevalent than has been estimated previously. Vaccination methods should not, at this time, be used generally for the control of this disease.

"A vast majority of the evidence indicates that Bang's disease is not usually significantly self-limiting in naturally infected herds. We prefer at present to disregard the small percentage of positive animals that cease to react under natural conditions and adhere to the policy of once positive always dangerous. In the pursuit of this policy we insist that the animals show definitely positive agglutination reactions before being diagnosed positive.

"We still prefer the test tube method of agglutination testing and have a little more confidence in it, but we recognize the possibilities and advantages of the rapid method. The variations in the results of the two methods are not sufficient to be serious."

Bang's disease (infectious abortion), I–IV, J. M. Buck (*Jersey Bul. and Dairy World, 52 (1933), Nos. 49, pp. 1539, 1540, 1559; 50, pp. 1567, 1585, 1586; 51, pp. 1595, 1596, 1608, 1609; 52, pp. 1626, 1643*).—This is a practical summary of the present status of knowledge of infectious abortion.

Studies of the nematode Oesophagostomum radiatum, G. D. Jelen (*Vet. Alumni Quart.* [*Ohio State Univ.*], *21 (1933), No. 3, pp. 89–97*).—In examinations made of the intestines of 1,136 native Ohio cattle consisting of cows, heifers, bulls, and steers for the presence of nodules caused by *O. radiatum*, 89 percent were found to be infected. "Of this 89 percent, 58 percent showed only slight infection and the other 31 percent showed extensive infection. No marked difference was found in the percentage of extensively infected native Ohio cattle and that of other cattle-raising States. Nodules were found to be fairly constant for the months covered by this survey. Aged animals carried the highest percentage of extensive infection, while young animals carried the highest percentage of slight infection.

"*O. radiatum* caused the packing industry a loss during 1932–33 of 0.96 hr. of labor plus the loss of 31 casings on every hundred cattle slaughtered. The potential loss to the packing industry in the cattle of Ohio, based on the data of our survey, would be $62,405.10."

Further observations on the functional pathology of pregnancy disease of ewes, L. M. Roderick, G. S. Harshfield, and W. R. Merchant (*Cornell Vet., 23 (1933), No. 4, pp. 348–353*).—In work at the North Dakota Experiment Station the determination of the "crude fat" and the moisture content of the livers of ewes with pregnancy disease showed again the enormous degree of fatty metamorphis (E.S.R., 68, p. 817). "There does not appear to be a reduction in the total amount of moisture in the liver as a whole, although there is a marked decrease on a percentage basis. The glycogen content of the liver was found to be reduced to a fraction of its normal content. The sheep is thereby unable to maintain the carbohydrate level of the body, and the abnormal metabolism involving the acid-base equilibrium cannot be avoided and so appears as a characteristic feature of the disease. The hypoglycemia has a correlation with an enormous loss of liver function. The function of the liver, as measured by the ability promptly to remove rose bengal from the blood, is seriously impaired. The character of the liver injury which develops, or its extent, is such that significant deviations were not encountered in the cholesterol and amino-acid content of the blood of these ewes."

Seasonal incidence of gastro-intestinal parasites of fat sheep in New South Wales, G. Kauzal (*Aust. Vet. Jour., 9 (1933), No. 5, pp. 179–186, fig. 1*).—The survey reported has shown that considerable infestations with *Haemon-*

chus contortus, *Trichostrongylus* spp., *Ostertagia* spp., and *Nematodirus* spp. may be commonly met with in sheep considered as "fat" stock.

"Over 14.6 percent of all sheep examined were infested with from 100 to 500 of *H. contortus*, 13 percent with over 2,000 *Nematodirus* spp., and 18 percent with over 2,000 *Trichostrongylus* spp. Heavy infestations with *Ostertagia* spp., *Oesophagostomum columbianum*, or *Chabertia ovina* were seldom met with. Considerable variation of seasonal incidence occurred in the various species, *H. contortus* and *Trichostrongylus* spp. falling from a marked peak in the summer quarter to a low minimum in the winter quarter. On the other hand, infestation with *Ostertagia* spp., *Nematodirus* spp., and *C. ovina* tended to remain more constant throughout the whole year. Egg production of *H. contortus* was found usually to be 5 to 10 times higher than that of *Trichostrongylus* spp. or *Ostertagia* spp., and from 50 to 100 times as great as that of *Nematodirus* spp."

Report on pulpy kidney disease of lambs (an acute enterotoxaemia of bacterial origin), D. A. Gill (*Wellington: New Zeal. Dept. Agr., [1933], pp. [3]+52, pls. 2*).—This account has been noted from another source (E.S.R., 70, p. 533).

Sore mouth in feeder lambs due to a filtrable virus, I. E. Newsom and F. Cross (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 2, pp. 233–247, figs. 3*).—In studies conducted at the Colorado Experiment Station it has been found that the sore mouth commonly recognized in western feeder lambs is due to a virus that will pass through Berkefeld V but not through Mandler normal filters. This virus produced lesions similar to, if not identical with, those described by Howarth in ewes and suckling lambs in California (E.S.R., 62, p. 877) and by Schmidt and Hardy in lambs and kids in Texas (E.S.R., 68, p. 251). It is pointed out that *Actinomyces necrophorus*, while at times producing serious complications, must be regarded as a secondary invader.

Navel infection in a lamb with Staphylococcus aureus septicemia and associated metastatic abscess formation, J. F. Bullard (*Jour. Amer. Vet. Med Assoc., 84 (1934), No. 2, pp. 251–253, figs. 2*).—This is a case report of navel infection in a crossbred Hampshire-Shropshire lamb, contributed from the Indiana Experiment Station.

Comparative studies on the viruses of vesicular stomatitis and equine encephalomyelitis, P. K. Olitsky, H. R. Cox, and J. T. Syverton (*Jour. Expt. Med., 59 (1934), No. 2, pp. 159–171*).—The authors here report upon studies of certain properties, in addition to those previously noted (E.S.R., 57, p. 877), of the virus of vesicular stomatitis of horses, and the characteristic biological reactions of the virus of equine encephalomyelitis. The viruses appear to be similar in many biological properties. In view of the fact that the horse is the natural host for both, it is suggested that they may be generically related, though not identical, since cross-immunity between them does not exist. It is pointed out that this absence of cross-immunity does not exclude the possibility of generic relationship, since there are at least three immunologically distinct types of foot-and-mouth disease, two of vesicular stomatitis, and two of equine encephalomyelitis virus.

Eradicating tuberculosis from poultry and swine, E. Lash (*U.S. Dept. Agr. Leaflet 102 (1933), pp. 8, figs. 7*).—This is a practical account describing the manner in which tuberculosis may be spread among poultry and swine, symptoms of the disease, post-mortem appearance, application of the tuberculin test, and manner of combating the disease in poultry and swine.

Misbranded poultry remedies, H. E. Moskey (*Poultry Sci., 13 (1934), No. 1, pp. 23–28*).—This is a discussion of the subject as related to requirements of the Federal Food and Drugs Act and the Insecticide Act.

Studies on incubator hygiene.—III, Germicidal properties of formaldehyde, sulfur dioxide, chloropicrin, and chloracetophenone, R. Graham and V. M. Michael (*Poultry Sci., 13 (1934), No. 1, pp. 40–43*).—In this continuation of the studies of incubator hygiene (E.S.R., 68, p. 97) the authors report having found that "formaldehyde released in germicidal amounts for *S*[*almonella*] *pullorum* in a forced-draft incubator was not retained in the incubator in sufficient amounts three hours later to destroy the organism. Double amounts of formaldehyde employed at time of hatching proved injurious to chicks, precluding the use of larger amounts of formaldehyde than previously recommended in routine hatching. A massive *S. pullorum* infection introduced into the incubator at hatching time was appreciably reduced by fumigation as judged by chick livability and bacteriological examination of contaminated swabs subjected to fumigation.

"Sulfur dioxide, chloropicrin, and chloracetophenone were found to be impractical for incubator disinfection."

Davainea proglottina and disease in fowls: The pathogenicity of the common poultry parasites, E. L. Taylor (*Vet. Jour., 89 (1933), No. 11, pp. 500–504*).—This is a contribution presented at the World's Poultry Congress held at Roma in September 1933.

The pathology of fowl paralysis, with some aspects of its cause and control, E. A. Seagar (*Vet. Jour., 89 (1933), No. 10, pp. 454–473, pls. 2*).—Summarizing the studies here reported the author points out that (1) experimental work has shown the etiological agent of this disease to be a virus and not a cell particle. "This is clearly demonstrated by its ability to pass through a Berkefeld filter and to withstand storage in glycerol at —5° C. for several days. (2) The virus in fowl paralysis acts primarily on the brain, spinal cord, and peripheral nervous system. (3) The main symptoms may not be referable to a central origin, but may be produced by lesions in the autonomic nervous system associated with various organs. (4) The virus may provoke a cellular infiltrative hyperplasia of tumorlike proportions in various visceral organs, particularly the ovary. (5) Lymphoid cellular lesions of the iris are frequent. (6) Lymphocytosis in the blood is usually present in active cases. (7) The virus can apparently remain latent in the tissues for many months until factors determine its advance, or it can smoulder for some time, producing merely incipient or transient symptoms which may escape detection and yet act as a focus of infection, transmitting the condition to the progeny through the egg or to young normal birds by contact. On the other hand, it may progress very quickly, with few signs on post-mortem examination except those in the brain and spinal cord or the autonomic ganglia. (8) The average incubation period is usually over 2 mo. (9) Natural infection appears to take place through the egg or by ingestion, the path of ingress presumably being through the mucous membrane of the alimentary canal. The fecal excretions would appear to convey infection during the incubation and some aspects of manifestation of the virus. (10) Natural infection occurs during the first few months of life, and susceptibility decreases after 6 mo. of age. (11) The maximum incidence of onset of symptoms occurs usually at 3 to 6 mo. of age in natural infections. (12) Artificial infections can be produced at any time up to a year of age. (13) Various factors, such as environmental conditions in rearing and infestation with parasites amongst others, help to precipitate the invasion of the tissues by the virus. (14) The importation of breeding stock into a flock, particularly infected cockerels, often determines the ultimate onset of an outbreak amongst the progeny. (15) Apart from care in making sure that the foundation breeding stock is clear from the disease and that chance of contact infection is eliminated, measures taken to actively immunize the progeny give promise of ultimately providing a method of control."

Investigations concerning the B. pullorum and bacteria pertaining to the Salmonella group, L. Bahr and N. P. C. Christensen (*Vet. Jour., 89 (1933), No. 12, pp. 561–569*).—Contributing from the State Veterinary Serum Laboratory, Köbenhavn (Copenhagen), the authors report upon a series of agglutination examinations with fowl typhoid sera from hens and *S. pullorum*, *S. sanguinarium*, and related bacteria, together with some peroral infection experiments with ratin bacilli on twenty-one 24-hour-old and 9 older (4- to 8-week) chickens and 10 full-grown hens.

Experimental trichinosis in chicks, D. L. Augustine (*Science, 78 (1933), No. 2035, pp. 608, 609*).—In the study briefly reported mature *Trichinella spiralis* larvae have been demonstrated consistently in the musculature of chicks fed infective material. This is said to be the first time, so far as the author is aware, that the development of muscle larvae from oral infection has been observed. The results indicate that a large number of larvae are destroyed in the gizzard of birds.

Experiments were also conducted in which four 11-day-old chicks were etherized, and over a thousand *Trichinella* larvae liberated from their cysts by the ingestion method were injected directly into the lumen of the jejunum of each. From examinations of these chicks, one of which was killed 3 days later and the remaining three 54 days after injection of larvae, it appears that the protective mechanism of chickens against trichinosis is not centered solely in the gizzard. It is concluded that most of the larvae are destroyed after dissemination in the body, the manner in which they are destroyed remaining unknown. It is pointed out that at no time did any of the chicks show discomfort or ill effects from the infections with *Trichinella*.

"It may be concluded that *Trichinella* larvae occasionally invade and develop in the musculature of fowl. They have never occurred in sufficient numbers as to be microscopically demonstrable, so that their situation in relation to the muscle fiber is unknown. In this host the life of the larvae is evidently short, for a large proportion of those found appeared lifeless or degenerated. It is doubtful that infection from this source ever occurs."

A chronic carrier of fowl typhoid with testicular focalization, H. C. Gauger (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 2, pp. 248–251*).—This is a case report in which an organism isolated from the testicles of a bird showed morphological, cultural, biochemical, and serological characteristics of *Salmonella gallinarum*. It is thought that the subject was, in all probability, a chronic carrier with testicular focalization of the organism.

Salmonella infections in young ducklings and ducks' eggs, G. H. Warrack and T. Dalling (*Vet. Jour., 89 (1933), No. 10, pp. 483–487*).—The authors report upon losses among young ducklings caused by *S. aertrycke* and *S. enteritidis* (Gärtner's bacillus). The infection of ducks' eggs with these two organisms has been found on many occasions. One source is the infected ovary of the duck producing the eggs. "Such ducks usually show a high agglutinating titer during the period when infected eggs are being produced. The titer falls fairly rapidly, and coincidentally no more infected eggs are laid. Infection of ducklings from outside sources also occurs."

Loss of virulence in the protozoon of "blackhead", a fatal disease of turkeys, and the immunizing properties of attenuated strains, E. E. Tyzzer (*Science, 78 (1933), No. 2032, pp. 522, 523*).—The author finds that the protozoan agent of blackhead (*Histomonas meleagridis*) upon being propagated outside of the body of the bird gradually loses virulence, remaining infective for young turkeys and other birds but no longer producing serious disease.

"Young turkeys infected through inoculation with attenuated strains are protected against virulent strains of the protozoan which are almost 100 percent fatal to unprotected birds. Once vaccination is accomplished, continuous exposure to virulent infection furnishes the most complete protection. Under long cultivation, the immunizing properties of a strain of *Histomonas* may in turn be lost. While our evidence is by no means complete, there is much to show that the immunity resulting from infection with attenuated strains of *Histomonas* is brought about by slight and transient invasions of the host tissues, which are not sufficiently progressive to produce the gross lesions of disease. Under continued propagation on culture medium, there is evidently a further loss in the invasive properties of the protozoan, and it may now fail to immunize completely. While it is possible that these results may lead to a method of vaccinating turkeys against blackhead, there are at the present time serious practical difficulties that prevent the adoption of the procedure for commercial purposes."

Diseases of canaries, R. STROUD, edited by H. C. SANBORN (*Kansas City, Mo.: Canary Publishers Co., 1933, pp. XI+239, figs. 4*).—A practical summary of information on the canary, its care and diseases.

The importance of disease in wild animals, A. D. THOMAS and W. O. NEITZ (*So. African Jour. Sci., 30 (1933), pp. 419–425, fig. 1*).—Included in this account are tables which show (1) diseases occurring in wild animals in the Union of South Africa and (2) diseases and their distribution in wild animals.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Arizona Station] (*Arizona Sta. Rpt. 1933, pp. 16–20, 25–27, 30*).—The progress results are briefly presented of studies of ground water, pumping machinery, downward movement in and water-holding capacity of soils, financial rehabilitation of irrigation and drainage districts, and land leveling and water penetration.

[Agricultural engineering investigations by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, p. 72*).—The progress results are briefly presented of investigations on poultry-house ventilation and farm tractors.

[Agricultural engineering investigations at the South Dakota Station], R. PATTY and W. C. TULLY (*South Dakota Sta. Rpt. 1933, pp. 8–11, 33, 34*).—The progress results are briefly presented of investigations on the use of the combine harvester-thresher; rammed earth for farm-building walls, especially poultry houses; field machinery for tractor and large horse teams; and the comparative length of service of galvanized steel posts and painted steel posts.

The experimental work of the department of engineering, C. DAVIES (*Jour. Southeast. Agr. Col., Wye, Kent, No. 28 (1931), pp. 284–287*).—In this contribution from the South-Eastern Agricultural College a description is given of the experimental program, including soil cultivation experiments and experiments on drilling, ridging wheat, transplanting of cabbage plants, and manure distribution.

Surface water supply of the United States, 1932, Parts 2, 6, 8, 10, 11, 12 C (*U.S. Geol. Survey, Water-Supply Papers 727 (1934), pp. VII+221, fig. 1; 731 (1933), pp. X+349, fig. 1; 733 (1933), pp. VI+197, fig. 1; 735 (1933), pp. V+107, fig. 1; 736 (1933), pp. XI+415, fig. 1; 739 (1933), pp. VI+167, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1932, part 2, prepared in cooperation with the States of Alabama, Florida, Mississippi, North Carolina, South Carolina, and Virginia, covers the South Atlantic slope and eastern Gulf of Mexico basins; part 6, prepared in cooperation with the States of

Kansas, Missouri, Montana, Nebraska, North Dakota, and Wyoming, the Missouri River Basin; part 8, prepared in cooperation with the States of New Mexico and Texas, the western Gulf of Mexico basins; part 10, prepared in cooperation with the States of California, Idaho, Nevada, Oregon, Utah, and Wyoming, the Great Basin; part 11, prepared in cooperation with the States of California and Oregon, with the Pacific slope basins in California; and part 12 C, prepared in cooperation with the States of Oregon and Washington, the North Pacific slope basins—Pacific slope basins in Oregon and lower Columbia River Basin.

Daily river stages at river gage stations on the principal rivers of the United States, compiled by M. M. Hayes (*U.S. Dept. Agr., Weather Bur., Daily River Stages, 30 (1932), pp. III+165*).—This volume, containing the daily river stages for 1932, is the thirtieth of a series (E.S.R., 69, p. 282).

The flow of water in flumes, F. C. Scobey (*U.S. Dept. Agr., Tech. Bul. 393 (1933), pp. 99, pls. 16, figs. 8*).—This is a technical treatise on flumes with particular reference to their carrying capacity for water. It includes an account of detailed field measurements and experiments and mathematical and hydraulic analyses leading to the elucidation of the elements and basic principles of flume design for various purposes and conditions.

The flow elements entering the design of the flume proper consist of quantity, Q, usually given in the conditions of the problem; the hydraulic radius, R, computed from the formula $R=A/p$ for the tentative section being tried in computations when A is the area of water cross section and p the wetted perimeter; the velocity, V, computed from $V=Q/A$ for the tentative section; an assumed value of the frictional factor, n; and the slope, $S=s$, for uniform flow, resulting from the solution of a standard flow formula such as Kutter's or Manning's.

Tables of drainage areas and river distances in the Mississippi River system, M. W. Hayes (*U.S. Dept. Agr., Weather Bur., 1933, pp. 26*).—These tables include drainage areas of the eight principal basins comprising the Mississippi River system, drainage areas of subbasins, drainage areas above river gages, distances of gages above mouths of rivers, and distances between mouths of tributary streams.

Design and operation of drainage pumping plants in the upper Mississippi Valley, J. G. Sutton (*U.S. Dept. Agr., Tech. Bul. 390 (1933), pp. 60, pls. 8, figs. 30*).—The results of a study of 17 representative drainage pumping plants in the upper Mississippi Valley extending over a period of 6 yr. are presented, the purpose being to present technical information on the elements to be considered in the design of such plants, data for use in determining these elements in the upper Mississippi Valley, the selection and design of drainage pumping equipment, and the construction and operation of pumping plants.

It is pointed out that a drainage pumping plant should be designed to pump the estimated maximum run-off rate at the maximum lift. In the upper Mississippi Valley, minimum lifts range from 0 to 9 ft., and maximum lifts range from 12 to 25 ft. The average lift during the low-water season for a period of years should be the basis for designing a low-lift pumping unit in a multiple-unit plant.

The annual run-off to be pumped should be determined in order to estimate the annual plant factor and cost of pumping. The estimated average run-off pumped from districts that were affected by backwater from dams ranged from 16 to 35 in. per year, and from districts not affected greatly by backwater ranged from 12 to 16 in. The annual run-off from districts that obtained some gravity drainage and were not affected by backwater from dams was estimated as from 5 to 15 in.

The distribution of run-off according to static lift should be determined in order that the plant can be designed for maximum efficiency at the lift at which the greatest amount of pumping must be done and that one or more units can operate efficiently at any lift.

The required capacity for a drainage pumping plant in the upper Mississippi Valley, at maximum lift, in terms of average total run-off pumped per year and a coefficient varying with size of drainage area and degree of protection provided for the lands, may be computed as $C=K_1(0.22+0.006r)$. A formula for general application is $C=K_1[K_2+K_3(r-a)]$.

In these formulas

C=plant capacity at maximum lift, in inches depth of run-off for 24 hr.
K_1=size and adequacy coefficient, depending upon area drained and adequacy of drainage
K_2=rainfall-run-off coefficient, equal to the run-off capacity for all-gravity systems draining similar areas and topography
K_3=seepage coefficient, indicated by the slope of the line of recommended capacities
r=total annual run-off to be pumped, in inches depth over the drainage area
a=number to be determined empirically for each particular region

An appendix includes data on drainage pumping plants in the upper Mississippi Valley in 1930.

Problems in the design of structures for controlling groundwater, D. Farr and W. Gardner (*Agr. Engin., 14 (1933), No. 12, pp. 349–352, figs. 3*).—Studies conducted at the Utah Experiment Station are reported from which the conclusion is drawn that, under certain conditions where artesian strata lie near the surface, adequate drainage requires such close spacing of drains as to render the cost prohibitive. Where pumping for drainage is to be adopted, the well battery system offers important advantages over the small wells constructed under present practice in the West. The analysis seems to point definitely to the conclusion that there is opportunity for improving the efficiency of design of such well structures by specifying large diameters. The conclusions rest upon an ideal set-up of conditions, but the analysis is thus rendered clear and the authors believe serious consideration should be given to such procedure.

Mole draining, C. Davies (*Jour. Southeast. Agr. Col., Wye, Kent, No. 28 (1931), pp. 296–299*).—In this contribution from the South-Eastern Agricultural College information is presented on accepted practice on mole draining in England.

A diker-ridger, H. E. Murdock (*Montana Sta. Bul. 281 (1933), pp. 12, figs. 10*).—The construction and use of home-made grader-dikers are described and illustrated. This equipment is used to construct dikes around dry farm areas for the retention of precipitation water which otherwise would run off.

Federal legislation and regulations relating to highway construction under the National Industrial Recovery Act, Federal-aid and national-forest roads, flood relief, and miscellaneous matters, compiled by the Bureau of Public Roads (*U.S. Dept. Agr., 1933, pp. III+76*).—The text of the laws and regulations is given.

Public Roads, [January 1934] (*U.S. Dept. Agr., Public Roads, 14 (1934), No. 11, pp. 197–222+[2], figs. 23*).—This number of this periodical contains the current status of U.S. Public Works road construction and the National Recovery road construction as of December 31, 1933, and the following articles: Stability Experiments on Asphaltic Paving Mixtures, by W. J. Emmons (pp. 197–211, 218); Relative Viscosities of Liquid Asphaltic Road Materials at

Various Test Temperatures, by J. T. Pauls and R. H. Lewis (pp. 212–218); and A Laboratory Traffic Test for Low-Cost Road Types (p. 219).

An investigation of the performance characteristics of reinforced brick masonry slabs.—II, A comparison of the performance characteristics of reinforced brick masonry slabs and reinforced concrete slabs, J. W. Whittemore and P. S. Dear (*Va. Engin. Expt. Sta. Bul. 15 (1933), pp. 45, figs. 11*).—The investigations reported in this bulletin were intended as a continuation of studies previously reported (E.S.R., 67, p. 752). In order to substantiate further the earlier conclusions, tests were made on four reinforced concrete slabs having the same size, type of reinforcement, percentage of steel, and effective depth as possessed by the slabs of reinforced brick masonry previously tested. This made possible a comparison of the various performance characteristics of the reinforced brick masonry and the reinforced concrete slabs.

It was found that over ranges of loading well past design loads, the slabs of both types of construction perform like homogeneous beams in that all relations of load and moment to deflection and stress are linear. The slabs of both types of construction possess ample stiffness even well above design loads. From the viewpoint of induced stresses, both types of construction exhibit very ample safety factors when reinforced concrete theory is used as the basis of design. The various performance characteristics of both types of construction are strikingly similar and in very close agreement throughout the entire range of loading. The formulas of reinforced concrete design are adaptable and applicable to the design of reinforced brick masonry slabs.

A strong gothic roof construction, L. J. Smith (*Agr. Engin., 14 (1933), No. 12, p. 346, fig. 1*).—In this brief contribution from the Washington Experiment Station, an improved and strengthened gothic roof construction for barns is described and illustrated.

Effects of pre-heating on the operation of a high compression tractor engine using alcohol and alcohol-gasoline blends as fuels, A. L. Teodoro (*Philippine Agr., 22 (1934), pp. 625–652, figs.* [8]).—Studies conducted at the University of the Philippines are reported, the purpose of which was to determine the effects of a preheating device on the operation of a tractor engine when alcohol and gasoline-alcohol blends were used as fuels. The engine used was a 4-cylinder type with 4.75-in. bore and 6-in. stroke. Compression ratios used were 4.42:1, 5.22:1, and 5.92:1. The fuels used were gasanol containing 50 parts alcohol, 45 parts gasoline, and 5 parts sulfuric ether, by volume; gastarla containing 60 percent alcohol, 35 percent gasoline, and 5 percent benzol motor alcohol; Kabankalan motor alcohol; special denatured alcohol containing 2 percent gasoline; and gasco containing 100 parts ethyl alcohol, 10 parts sulfuric ether, and 2 parts methyl alcohol.

Short tests showed that with the compression ratio of 4.42:1, the engine was able to develop more than 40 hp. A decrease of about 2 percent in the horsepower developed was noted when medium preheating was used and about twice that amount when full preheating was applied. The consumption was most economical with medium preheating at or near the rated load. From one-fourth load to three-fourths load the most economical fuel consumption was shown with full preheating. With the compression ratio of 5.22:1, a decrease in power of about 6 percent was developed when full preheating was applied. With medium preheating, however, the power increased by 1 percent over that without any preheating. The consumption at the highest load was most economical with medium preheating. From one-fourth to three-fourths load with full preheating it was definitely shown that the consumption was less than without any preheating.

With the compression ratio of 5.92 : 1, the maximum power developed with medium preheating dropped by about 5 percent. With full preheating the decrease was more than 7 percent. From one-fourth load to about three-fourths load medium preheating showed the most economical fuel consumption. Full preheating showed a more economical fuel consumption than without any preheating at these same points.

The carburetor opening that was found to give the rated power of the engine with the lowest compression ratio using no preheating was found to be too large to give the same power when the engine was run with higher compression ratio. Much smaller openings were used at higher compression ratio. The engine could easily develop 40 hp. with increased compression ratio. Medium preheating indicated the best arrangement to give the most economical fuel consumption. The power of the engine decreased from 2 to 6 percent when preheating was applied. Full preheating with higher compression ratio was characterized by jerky operation, especially near the highest load. With full preheating the power of the engine could not be maintained constant after 30 min. of operation.

The results of all tests using gastarla motor alcohol showed that with the carburetor set to give the rated power without preheating at the lowest compression ratio, it was easily possible to develop more power with a higher compression ratio. Short tests proved that as high as 8 percent above that of the rated capacity could be produced without reducing the number of turns best suited for low-compression operation. A decrease of power from 2 to 5 percent was found when preheating was applied. The most economical point occurred when medium preheating was used. With full preheating the consumption was generally higher at full load but was lower from one-fourth to three-fourths load than without any preheating. Full preheating very often caused the engine to run unsteadily and to decrease the power after a few minutes of operation.

The results of tests using motor alcohol indicated that the maximum power that could be developed was higher with no preheating than with preheating. The larger the compression ratio, the higher the maximum power. It was not possible to reach the rated point with wide open choke even at a compression ratio of 5.22 : 1. Slightly choking the valve increased the power more than the rated capacity, but at the expense of too much fuel. The fuel consumption with full preheating appeared to be the most economical up to and including the compression ratio of 5.22 : 1. At the compression ratio of 5.92 : 1, medium preheating gave a more economical result than full preheating. All other things being equal, the higher the compression ratio the less was the fuel consumption per brake horsepower-hour.

The results of all tests using Kabankalan motor alcohol as a fuel showed that with a fuel jet area the same as the one adapted for gasoline or kerosene it was impossible to develop the maximum brake horsepower of the engine when operated with wide open choke. Only from 75 to 80 percent of the rated power was reached at the compression ratio of 4.42 : 1 and from 83 to 89 percent at the compression ratio of 5.22 : 1. At the compression ratio of 5.92 : 1, the engine maintained constant operation near the full load. Slightly choking the carburetor caused the engine to develop more power at the expense of too much fuel. Medium preheating definitely showed economy of fuel compared with no preheating. It was indicated that there was very little difference in fuel consumption between medium and full preheating. Near the lighter loads, full preheating showed more economical consumption than medium preheating. The higher the compression ratio the greater was the power developed and the less was the fuel consumption per brake horsepower-hour.

With special denatured alcohol motor fuel the rated power of the engine could not be developed under any circumstances if the choke was kept wide open. Choking caused the engine to produce power even greater than the rated capacity. It was indicated for the higher compression ratios that the greater the preheating the more economical was the fuel consumption. For a compression ratio suitable for normal operation on gasoline or kerosene, medium preheating showed better economy than either full preheating or without any preheating. Very poor fuel economy resulted when (1) too much choking was practiced with some degree of preheating, and (2) when the carburetor opening was not adjusted to give the minimum requirement. An overrich mixture was hard to detect when alcohol fuel was used. All other things being equal, the higher the compression ratio the greater the power developed and the less the fuel consumption per brake horsepower-hour.

The results of all tests using gasco as a fuel showed that the normal jet opening best adapted for gasoline or kerosene was too small to permit enough fuel to operate the engine constantly at full load with wide open choke. As the compression ratio was increased, the maximum power that could be developed was also increased. Slightly choking the carburetor increased the power considerably. It also caused the engine to consume more fuel than would be necessary to run it with wide open choke. The higher the degree of preheating the more economical the consumption per brake horsepower-hour. The higher the compression ratio the less the consumption per brake horsepower-hour.

In general, it was observed that without any alteration in the size of the original fuel jet and using the compression ratio adapted for either gasoline or kerosene, only those fuels containing 35 percent of gasoline and over could run the engine at its rated capacity. Alcohol and alcohol-gasoline blends did not require as much preheating as did kerosene. With increased compression ratio the drop in power with much increase in heat was less in nearly straight alcohol fuels than in the blended ones. With little preheating a small gain in fuel economy was observed.

Knock rating of gasolines may be estimated from analysis, A. W. Trusty (*Natl. Petrol. News, 24 (1932), No. 51, pp. 29, 30, 32*).—This is a brief presentation of some of the salient facts regarding the relationship between the composition of gasoline and its knock rating. It is pointed out that knock ratings of motor fuels are determined by the percentage composition of the different types of hydrocarbons composing any particular gasoline. The knock rating of any fuel may thus be closely estimated from the results of an analysis of the constituent hydrocarbons present.

Low manifold temperatures minimize trouble with gum, laboratory experiments show, S. P. Marley, W. P. Ridenour, and W. A. Gruse (*Natl. Petrol. News, 24 (1932), No. 44, pp. 22–28, figs. 4*).—In a contribution from the University of Pittsburgh, data are presented from preliminary experiments on the significance of gum content of gasoline as related to gum deposits. The results were obtained under laboratory conditions with experimental equipment.

The work included a study of deposits in both intake manifold and combustion chamber and of deposits with the same fuel in full-size single-cylinder engines. In both cases the manifold temperatures were varied over a considerable range. The conclusion is drawn that a moderate gum content can be tolerated in an engine if the temperature of the mixture in the manifold is kept low. As soon as much heat is applied a fuel containing an appreciable amount of gum will begin to deposit this gum, and such deposits are heavier from a rich mixture than from a lean one.

The carbon deposits in the combustion chamber are somewhat but not much greater with gum-bearing fuels at low intake temperatures, but the well-known tendency to lower carbon deposits with higher heat temperatures could readily be invoked to remedy this difficulty. The results as a whole suggest that by lowering intake manifold temperatures volatile gasolines of moderate gum content may perhaps be used without serious trouble from gum deposits.

Resistance to sludging, extreme long life of new synthetic oils, D. P. Barnard (*Natl. Petrol. News, 24 (1932), No. 46, pp. 62, 64, 68, 72, figs. 2*).—Recent studies of the properties and performance of synthetic lubricants made by polymerizing cracked paraffin wax with anhydrous aluminum chloride as the reagent are briefly reported showing that these lubricants are extremely resistant to oxidation in service where the oil is exposed to oxygen at high temperatures and in finely divided condition. Very low carbon formation rates are shown by these investigations, and the percentages of asphaltenes found after severe tests are particularly low when compared with similar results on regularly manufactured lubricants from all crudes.

A method of testing low pressure characteristics of oils and greases, E. F. Bittner (*Natl. Petrol. News, 24 (1932), No. 42, pp. 31–33, fig. 1*).—A test is described which has proved of value in predicting cold weather behavior of steering gear, transmission, and differential lubricants. In this test a steel ball is suspended in the lubricant by means of a wire, the entire assembly is chilled to the desired temperature, and the ball is then pulled out by means of a spring balance or other suitable means of determining the resistance to flow. Practical tests have confirmed the predictions made from the laboratory results.

Extreme pressure lubricants, O. L. Maag (*Natl. Petrol. News, 24 (1932), No. 46, pp. 53, 54, 56, 59, 61, figs. 8*).—Laboratory data are given on load-carrying capacity, corrosiveness, stability, and abrasive properties of various types of gear and bearing lubricants.

A comparison of cup-feed and force-feed cereal drills, C. Davies (*Jour. Southeast. Agr. Col., Wye, Kent, No. 28 (1931), pp. 243–266, pls. 4, figs. 2*).—Tests conducted at the South-Eastern Agricultural College are reported which included 5 drills, 2 of the cup-feed and 3 of the force-feed type.

Tests in the laboratory to determine the intercolter differences disclosed the fact that the cup-feed drills, which were fitted with adjustable shutters and mechanism for altering the angles of the hoppers, were incapable of giving good intercolter performances unless the shutter apertures and angles were those found by elaborate trial best suited to the drill. On hilly fields the angles would alter frequently. The force-feed machines had no shutters, and they were not much affected by altering the angles of the hoppers.

The effects of speeds of 1, 2, 3, 4, and 5 miles per hour on the drills were determined. It was found that at the higher speeds the intercolter differences of the cup-feed drills were considerably increased, and the deliveries, in bushels per acre, also varied. In one drill it rose to nearly 14 bu. per acre at 5 miles per hour when set to sow at 5 bu. per acre. Neither the intercolter differences nor the per acre rates were sensibly altered by speed fluctuations where the force-feed machines were concerned.

Another angle test was employed. This time one end of the hopper of each drill was raised, giving it a 1-in-10 incline. This seriously upset the intercolter performance of one of the cup-feed machines. The tilting had no appreciable effect on the force-feed drills.

The performances along the colter rows were studied in the laboratory and in the field, specially devised methods, which are described, being used. The method used in the field gave an idea of the per-inch as well as the per-foot distributions. The force-feed drills gave better distributions along the rows than the cup-feed. It was concluded that two of the force-feed drills were likely to be better machines for grain growers than the others.

The weight of grain in the hoppers had no influence upon the mean colter deliveries in any of the drills. The method of determining the speed fluctuations in the field is described. These varied from 1.7 to 5.25 miles per hour. None of the drills caused any measurable damage to the grain.

Producing a potato crop with the all-purpose tractor, R. U. Blasingame and A. W. Clyde (*Agr. Engin., 14 (1933), No. 12, pp. 331–335, figs. 6*).—This paper, a contribution from the Pennsylvania Experiment Station, is limited to the problems involved in the development and adaptation of equipment to be used with the all-purpose tractor in the growing of potatoes on a commercial scale. Recommendations also are made for further study and development of the mechanical equipment used in potato production.

The adjustment and repair of mowers, M. A. Sharp, V. S. Peterson, and E. G. McKibben (*Iowa State Col. Ext. Bul. 192 (1933), pp. 15, figs. 11*).—This bulletin covers the common adjustments and repairs of mowers in a popular manner.

The abrasive effect of lime as used in Bordeaux mixture, E. L. Nixon (*Agr. Engin., 14 (1933), No. 12, pp. 335, 336, figs. 8*).—The results of a study conducted at the Pennsylvania Experiment Station on the wear of spray nozzle equipment by Bordeaux mixture are briefly reported.

Examination of the spray nozzle disks revealed that the orifices were enlarged unsymmetrically, having worn more on the exit than on the entrance of the opening. The erosion appeared to be conical. The summary of the comparative losses in weight indicates an instructive relationship between the kind of lime used in the preparation of the spray mixture and the wearing of the disks. It was shown that size and shape of disk opening, whirl plates, and pressure are interrelated. It is clear that this balance is upset sooner from the use of pulverized and hydrated lime, due to the more rapid erosive effect.

Estimated data on the energy, gaseous, and water metabolism of poultry for use in planning the ventilation of poultry houses, H. H. Mitchell and M. A. R. Kelley (*Jour. Agr. Res. [U.S.], 47 (1933), No. 10, pp. 735–748*).—This paper, which is a joint contribution from the Illinois Experiment Station and the U.S.D.A. Bureau of Agricultural Engineering, contains estimations of the gaseous, energy, and water metabolism of poultry for use by the agricultural engineer when designing heating or ventilating systems for poultry houses.

The calculations are based mainly on metabolism studies conducted at the station with Plymouth Rock and White Leghorn chickens, the Bronze turkey, the Pekin duck, and the Embden and Toulouse geese. The data assembled are discussed from the engineering viewpoint and their practical use by the engineer demonstrated.

A study of dairy corral surfacings, J. D. Long (*Agr. Engin., 14 (1933), No. 12, pp. 347, 348*).—Investigations by the California Experiment Station are briefly reported which indicate that hard-surfaced dairy corrals deserve consideration from the standpoint of sanitation, disease control, reduced cleaning labor, and manure saving. An area of from 50 to 75 sq. ft. of surfaced corral per animal is recommended. Wood plank is particularly adapted for hillside construction. Portland cement concrete surfacings properly designed and laid are generally considered successful. Possible economies may result from the use of cement mortar macadam of the "Hassam" pavement type. Asphaltic surfacings may possess advantages of a lower heat conductivity rate, greater resilience, and lower cost. Certain types seem especially well adapted to the economical use of farm labor and hand tools. Due to the ductility of certain types of asphaltic surfacings, it is recommended that when they are used portland cement concrete slabs be laid in areas subjected to concentrated traffic, as along mangers and in doorways. A firm base protected from underseepage is important to portland cement and asphaltic concrete slabs, and thermal expansion joints are necessary for the former. Positive surface drainage is essential to the success of any surfacing.

Pen barn and milking room, C. H. JEFFERSON (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 84–88, figs. 4*).—Practical information is given on the pen barn and milking room, accompanied by plan drawings.

Milk house and cooling tank construction, C. H. JEFFERSON and G. M. TROUT (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 88–94, figs. 5*).—Practical information is given on the construction of a milk house and cooling tank, together with working drawings and a bill of materials.

A review of progress in farm sanitation, R. W. TRULLINGER (*Agr. Engin., 14 (1933), No. 12, pp. 344–346*).—In this contribution from the U.S.D.A. Office of Experiment Stations a brief review of progress in farm sanitation in the United States is presented, together with a selected bibliography of publications issued during the past 10 years which gives a cross-sectional view of the character and quality of both the research and extension work in the subject.

AGRICULTURAL ECONOMICS

The foundations of agricultural economics, J. A. VENN (*Cambridge, Eng.: Univ. Press, 1933,* [*2. ed.*], *pp. XX+600, pls.* [*24*], [*figs. 23*]).—This is a revised and enlarged edition of the volume previously noted (E.S.R., 51, p. 290). Chapters dealing with the interrelationship of economic theory and agricultural practice, crop estimating and forecasting, and British agriculture since the World War have been added and other chapters divided.

Scope and method series, J. D. BLACK ET AL. (*Social Sci. Res. Council Buls. 9 (1933), pp.* [*8*]*+271; 15 (1933), pp.* [*8*]*+180; 17 (1933), pp.* [*4*]*+130; 18 (1933), pp.* [*6*]*+112; 19 (1933), pp.* [*6*]*+78; 20 (1933), pp.* [*6*]*+89; 21 (1933), pp.* [*4*]*+44*).—These reports on scope and method are designed to be of aid to specialists and administrative officers dealing with the subfields listed in agricultural economics and rural sociology. No. 9 is Research in Farm Products; No. 15, Research in Agricultural Cooperation; No. 17, Research in Social Psychology of Rural Life; No. 18, Research in Rural Institutions; No. 19, Research in Farm Real Estate Values; No. 20, Research in Agricultural Land Tenure; and No. 21, Research in Agricultural Policy.

Methods of statistical analysis in the social sciences, G. R. DAVIES and W. F. CROWDER (*New York: John Wiley & Sons; London: Chapman & Hall, 1933, pp. XI+355, figs. 44*).—This is a textbook for an introductory course in statistics as applied to the social sciences. Gathering and presenting data, averages, dispersion, index numbers, time series trends and analysis, correlation, and probability and frequency curves are covered. The chapters are divided so as to first give the more elementary and basic processes and then the more complex and specialized methods. The methods are illustrated and problems are given.

Calculation and interpretation of analysis of variance and covariance, G. W. SNEDECOR (*Ames, Iowa: Collegiate Press, 1934, pp. [5]+96*).—This book, written for research workers with but moderate training in statistics and for classroom use, presents a group of applications of variance and covariance. Detailed methods for calculating ten different types, with explanations of the meaning of each and the circumstances under which it can be used, are discussed.

A theory of the variation of costs, J. A. HOPKINS (*Jour. Farm Econ., 15 (1933), No. 4, pp. 621–632, figs. 3*).—This is a contribution of the Iowa Experiment Station. Using data gathered in Iowa on the costs of production of corn and hogs, the principle is discussed that "costs per unit of production tend to vary by proportionate rather than absolute amounts. Consequently, when logarithms of a sample of costs per unit of product are incorporated into a frequency distribution it tends to conform to the normal frequency curve."

The following conclusion is reached: "Under the qualification that the theory refers only to homogeneous or nearly homogeneous conditions, and with the corollary that even wider variations may occur in case of compound production processes, such data as were available have supported the theory remarkably well. But the implications of the principle are not all worked out, and so far there are only a priori explanations why the costs should vary in just this manner. It is to be hoped that other workers will test the theory further."

Agricultural adjustment: A report of administration of the Agricultural Adjustment Act, May 1933 to February 1934 (*U.S. Dept. Agr., Agr. Adjust. Admin., 1934, pp. XI+393, figs. 40*).—This report is discussed editorially on page 737.

[Papers presented at the twenty-third annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 15 (1933), No. 4, pp. 645–722*).—Included are the following papers, with discussions thereon, as presented at the meeting previously referred to (E.S.R., 70, p. 405): Use of the Type-of-Farming Material of the 1930 Census in Research and Teaching, by F. F. Elliott (pp. 645–655); The Theory of Combination of Enterprises on Individual Farms, by S. E. Johnson (pp. 656–669); Future Trading in Butter and Eggs, by C. A. Brown (pp. 670–676); Extension in Cooperative Business Management, by M. C. Bond (pp. 677–684) and R. K. Froker (pp. 685–690); Education Preliminary to Cooperative Organization, by B. B. Derrick (pp. 691–697); Instruction in Cotton Classing, by A. W. Palmer (pp. 698–707); and The Economic Basis of Market Grades, by O. B. Jesness (pp. 708–719).

Included also are the conclusions of the committee composed of H. B. Price et al. on the Outlook for Cooperative Marketing of Tobacco (pp. 720–722).

[Investigations in agricultural economics] (*Jour. Farm Econ., 15 (1933), No. 4, pp. 723–741, figs. 3*).—Notes are included on the following investigations and subjects: Vertical and Horizontal Shifts in Demand Curves, by G. Shepherd (pp. 723–729); The California Agricultural Prorate Act, by E. A. Stokdyk (pp. 729–731); Reduction of Farm Taxes Through Changes in Rural Government, by G. S. Wehrwein and B. W. Allin (pp. 731–733); Value of Illinois Farm Land, by H. C. M. Case (pp. 734–737); Effective Collection of Farm Practice Data, by P. G. Minneman (pp. 737–740); and Interdependence of Farm Real Estate Values and Certain Social Factors, by O. D. Duncan and H. K. Bayless (pp. 740, 741).

[Investigations in agricultural economics at the Michigan Station] (*Michigan Sta. Quart. Bul., 16 (1933), No. 2, pp. 69–73, 76–79*).—Results of investigations are reported as follows:

Changes in farm income in central Michigan, P. F. Aylesworth (pp. 69–73).—Financial records covering the years 1929–32 for 65 farms are analyzed. Tables are included and discussed comparing, by years, the average cash receipts by items, the inventory changes, net cash and net farm income, earnings on investment, and operator's labor and management wage. Another table shows, by years, the changes in farm organization as measured by livestock numbers, crop acres, and number of men per farm.

The average net cash income decreased from $1,499 in 1929 to $866 in 1932, earnings on investment from 3.8 to —3.1 percent, and operator's labor and management wage from $453 to —$965.

Planted timber more than pays its way, A. B. Bowman (pp. 76–79).—Using data as to costs, sales value of timber, etc., on the Beal Pinetum planted in 1896 at the station, computation is made of the rates of compound interest that would have been earned on similar plantings on private land under the Pearson Tax Act, 1925, amended, providing for a 10 percent cutting tax and an annual tax of 10 ct. per acre, and the Woodlot Tax Act, 1917, providing for a 5 percent cutting tax and an annual tax of 1.5 ct. per acre. Computation is also made on the basis of the Woodlot Tax Act except that no thinning of any kind is anticipated and no growing stock is removed until the end of the fortieth year.

The rates of compound interest earned were found to be 6 percent under the Pearson Tax Act with land costing $5 per acre; 6.4, 5.6, and 5 percent under the Woodlot Tax Act with land costs of $5, $10, and $15 per acre, respectively; and 6.7, 5.9, and 5.3 percent under the modified Woodlot Act plan with land costing $5, $10, and $15 per acre, respectively.

[Investigations in agricultural economics and farm management by the Cornell Station, 1932–33] ([*New York*] *Cornell Sta. Rpt. 1933, pp. 64–72*).—The various investigations in progress are described briefly, and brief statement of some of the findings given for the following studies: Economics of the production of market-garden vegetables, and economics of poultry farming in New York, both by E. G. Misner; cost study on a lamb-feeding enterprise in western New York, by P. V. Kepner; report of milk-marketing research, 1932–33, by L. Spencer and H. W. Mumford; an economic study of land utilization in Tompkins County, N.Y., 1930, by A. B. Lewis; and a study of part-time farming, by K. Hood.

[Investigations in agricultural economics by the North Carolina Station, 1931–32] (*North Carolina Sta. Rpt. 1932, pp. 19, 20, 29–31*).—Results of investigations not previously noted are reported, as follows:

Methods and practices employed in the production of cotton and tobacco, R. H. Rogers (pp. 19, 20).—Tables show the average cost in 1931, by items per acre, on all farms and on the low and high cost farms, for cotton on 26 farms and tobacco on 8 farms in Johnson and Wayne Counties.

Cotton marketing, J. G. Knapp and G. R. Smith (pp. 29–31).—A table shows the average percentages of grades and staple lengths of cotton ginned, 1931–32, in the Tidewater, Upper Coastal Plain, and Piedmont areas of North Carolina. Some results are also given of studies of the prices of cotton in relation to grade, staple length, and other factors, of the changes in recent years of staple length and grade consumption by North Carolina textile mills, and of local cotton-buying agencies in the State.

Current Farm Economics, Oklahoma, [December 1933] (*Oklahoma Sta., Cur. Farm Econ., 6 (1933), No. 6, pp. 125–147, figs. 3*).—Included are articles on the general agricultural situation and the dairy situation, by P. H. Stephens; the cotton situation, by L. S. Ellis; the wheat situation, by R. A. Ballinger; the hog situation, by P. Nelson; what is the significance of Russian recognition to Oklahoma farmers, by J. T. Sanders; and economic nationalism v. economic internationalism for American agriculture, by R. D. Thomas.

[Farm economics in Great Britain] (*Farm Econ.* [*Oxford Univ.*], *1* (*1933*), *Nos. 1, pp. 24, figs. 5; 2, pp. 25–48, figs. 3; 3, pp. 49–68, figs. 5; 4, pp. 69–88, figs. 5*).—Included are articles as follows: The Distribution of the Profits of the Land, by C. S. Orwin and J. R. Lee (pp. 2–4); The Reorganisation Commission and Pig Prices, by K. A. H. Murray (pp. 4–7); Horse Labour Costs, 1929–1930 (Oxford Province), by S. J. Upfold (pp. 8, 9); The Profitableness of Poultry Farming in the North of England in 1931, by A. E. Harris (pp. 9–13); The Effect of Different Price Policies on the Seasonal Production of Milk, by R. L. Cohen (pp. 14–16); The Effect of the Wheat Act, 1932, on Production, by R. McG. Carslaw and A. W. Menzies-Kitchin (pp. 17, 18); The Diminishing Use of Mangolds in the Feeding of Cows, by C. V. Dawe (pp. 19–22); The Pig Reorganisation Commission and Production Costs, by A. W. Menzies-Kitchin (pp. 25–28); Developing Poultry-keeping on a Mixed Farm, by C. Pringle (pp. 28–30); Investments in Farming, by J. Orr (pp. 31–33); Fat Lamb Production on Arable Land, by J. R. Lee (pp. 33–35); Variations in Liquid Milk Consumption, by B. L. Smith (p. 35); Size of Fields in the Eastern Counties of England, by R. McG. Carslaw (pp. 36, 37); Some Factors Affecting Profitableness of Mid-Devon Farms, by W. H. Long and C. Daniel (pp. 38–40); Labour Costs on Wiltshire Milk Producing Farms, by C. V. Dawe and J. D. Nutt (pp. 41, 42); Labour Costs on 56 Poultry Farms in the West Midlands in 1931–32, by R. Henderson (pp. 43, 44); Imports of Agricultural Products in 1932, by K. A. H. Murray (pp. 44–46); Permanent Equipment and Modern Farming, by A. Bridges (pp. 49–51); Sugar Beet; Labour Costs, 1924–1931, by R. N. Dixey (pp. 52, 53); The Producer-Retailer's Place in the Milk Trade, by F. J. Prewett (pp. 54, 55); Stock Markets in North Devon and North Cornwall, by J. J. MacGregor (pp. 55–57); Quantitative Regulation of Beef, Mutton, and Lamb Imports, 1933, by K. A. H. Murray (pp. 57–63); The Revised Price Formula for Bacon Pigs, by R. L. Cohen and K. A. H. Murray (pp. 63, 64); The Future of Milk Prices, by C. S. Orwin (pp. 69, 70); The Cost of Carting Dung, by J. R. Lee (pp. 70, 71); A Note on the Milk Yields of a Bail Herd, by R. N. Dixey (pp. 72, 73); Land Improvement by Warping, by A. G. Ruston and H. E. Nichols (pp. 74–76); Wheat Prices and Acreage, by K. A. H. Murray (pp. 77, 78); The Potato Situation, by R. L. Cohen (pp. 79–83); and Bacon and Bacon Pig Prices, January-September 1933, by K. A. H. Murray (pp. 83, 84).

Charts are also given in each number showing the prices of agricultural commodities in England and Wales, 1929–32.

[Agricultural economics studies in Wales] (*Welsh Jour. Agr.*, *9* (*1933*), *pp. 5–92, figs. 11*).—Included are reports on studies as follows: Dairying on Second Class Land: An Examination of Changes in Farming Systems, by A. W. Ashby and J. P. Howell (pp. 5–17); Costs of Production and Prices of Milk: A Study of Some Tendencies, by A. W. Ashby and W. H. Jones (pp. 17–28); Farmers' Cost of Milk Delivery in Wales, by J. P. Howell (pp. 29–38); Some Aspects of Consumption, Supplies, and Prices of Tomatoes and Cucumbers (pp. 38–56), Manual Labour Requirements of Livestock on Welsh Farms (pp. 56–70), and Financial Aspects of Glasshouse Production (pp. 70–78), all by J. L. Davies; and The Future of Cooperative Marketing of Farm Produce in Wales, by J. G. Williams (pp. 78–92).

[Semiannual indexes of farm real estate values in Ohio], H. R. **Moore** (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Buls. 49* (*1932*), *pp. 5; 53* (*1933*), *pp. 7, figs. 2; 61* (*1933*), *pp. 7*).—These bulletins continue the series previously noted (E.S.R., 66, p. 381), as follows: No. 49, January 1 to June 30, 1932; No. 53, July 1 to December 31, 1932; and No. 61, January 1 to June 30, 1933.

Development and taxation of private recreational land, G. S. WEHRWEIN and R. F. SPILMAN (*Jour. Land and Pub. Util. Econ., 9 (1933), No. 4, pp. 340–351, figs. 3*).—The problems of setting aside, disposing of, developing, and taxing lands to be used for recreational purposes are discussed, using the experience of the State of Wisconsin as a basis.

The use of credit on selected Kentucky farms, C. J. BRADLEY (*Kentucky Sta. Bul. 343 (1933), pp. 149–188, figs. 2*).—Data relating to organization, methods of operation, and financing were obtained for 406 large, owner-operated farms and surveys made of credit facilities in five counties in four areas representing different types of farming. The areas are described and analyses made by counties for the mortgaged and nonmortgaged farms of the capital investment in different classes of property, size of farms, sources of credit, mortgage indebtedness, sales and receipts, types of farm enterprises, taxes, age of operators, length of ownership, and seasonal and short time credit used.

About 40 percent of the farms studied were mortgaged. Debt and interest charges in 1929—a relatively prosperous year—equaled two thirds of the cash income of the farms. In 1930 they equaled and in 1931 and 1932 exceeded such income. Cash crops, particularly tobacco, occupied an important place in the production program of the mortgaged farms. Use of short term and merchant credit was prevalent on intensive tobacco production farms. Nonmortgaged farms had the higher ratio of investment in land and livestock and the lower ratio in dwellings and other buildings. Such farms had a total differential earning advantage of 11.5 percent. Owners of mortgaged farms were the younger and had had title the shorter time. Less merchant credit was used in 1929 than in former years. More medium-sized farms were mortgaged than either large or small farms. Approximately 50 percent of the 406 farms used short time credit, the number varying from one third to two thirds in the individual counties. The average amount used was $1,481, of which about 22 percent was store credit. One third of the farms used no credit of any kind in 1929.

The economics of Federal reclamation, W. MELCHER (*Jour. Land and Pub. Util. Econ., 9 (1933), No. 4, pp. 382–394, fig. 1*).—A brief history is given of the Federal Reclamation Act, and the Financial arrangements, repayment difficulties, the credit situation, and farming on the projects are described. It is proposed that present construction charges be changed to an annual rental charge based on "what the more fertile lands of the project could bear and still be farmed at a profit."

Farmers' Irrigation District, Nebraska: Rehabilitation and agricultural report, P. A. EWING and W. A. HUTCHINS (*U.S. Dept. Agr., Bur. Agr. Engin., 1933, pp. [3]+93+[18], figs. 4*).—This report of a study made in 1933 of this district, which contains about 90,000 acres in Scottsbluff and Morrill Counties, discusses the physical and social characteristics, the organization and financing, water rights, water supply, contractual relations with the United States and adjoining units, pending litigation, the management and operating organization and finances of the district, State, county, and school taxes, bonded indebtedness, individual indebtedness, farm ownership and operation, types of agriculture and returns from farming, and farm income in relation to fixed charges in the counties in which the district is located. A report on classification of the lands of the district made by the conservation and survey division of the University of Nebraska and the Nebraska Experiment Station is also included.

Part-time and small-scale farming in Maryland, W. P. WALKER and S. H. DEVAULT (*Maryland Sta. Bul. 357 (1933), pp. 223–253*).—Detailed information regarding cash farm receipts, receipts from nonfarm employment, farm investment, farm cash expenses, and cash expenditures of families for food and fuel was obtained by questionnaire and personal interviews with 198 families living on tracts of 20 acres or less. The families included 59 part-time (having other sources of income than the farm) and 22 full-time (having no other sources of income than the farm) farmers in two rural sections and 82 part-time and 35 full-time farmers on suburban farms in the regions adjoining Baltimore, Md., and Washington, D.C. Tables show by items the average investment, receipts, farm expenses, family expenses, family cash income from farm and from all sources, value of food and fuel furnished by farm, and total income for the four different groups of families. Other tables show similar data for the part-time and full-time farmers, each grouped on the basis of whether the farm included 2.5 or less crop acres, 2.75 to 10 crop acres, or 10.25 to 20 crop acres. Other tables show data for the different groups as to farm products used, cash savings per year from using products produced on the farm, numbers and kinds of livestock kept, marketing methods, vegetables grown, years on farm, etc.

The average family cash income from all sources and the total family income (cash income plus food and fuel produced and consumed on the farm) for the different groups were rural part-time families —$28.55 and $475.18, rural full-time —$75.85 and $377.32, suburban part-time +$391.98 and $773.46, and suburban full-time —$233.99 and $113.49. The total family income for the part-time farms of different sizes was for farms less than 2.5 crop acres $556.37, farms of 2.75 to 10 crop acres $878.84, and farms of 10.25 to 20 crop acres $707.61. For the full-time groups the incomes were $193.18, $205.40, and $75.11, respectively.

Farm systems in northwest Wisconsin, D. R. Mitchell and P. E. McNall (*Wisconsin Sta. Bul. 426 (1933), pp. 40*).—A study was made of 25 Barron County farms during a 3-yr. period, daily records kept by the operators being checked monthly by a trained worker. In analyzing the data the farms were grouped into three groups according to size—40–60 crop acres, 61–80 crop acres, and over 81 crop acres. The problems of each group are discussed and suggestions made as to their solution.

On the small farms increase of volume of business by better crop and livestock production, by purchase of feed to support more livestock, and by off-farm work in slack periods, and overcoming of high unit cost by intensive methods of farming are important in obtaining satisfactory net returns. On the medium farms less intensification was necessary, but excessive labor costs were found common due to there being too much work for the operator and family but not sufficient to keep another full-time worker busy at all times. On the larger farms the problems are less acute as sufficient volume of business is more easily attained, intensity of production is less necessary, and labor is more easily kept fully occupied.

Land utilization in the Hawaiian Islands, J. W. Coulter (*Hawaii Univ., Res. Pubs. No. 8 (1933), pp. 140, figs. 33*).—Maps, tables, and graphs are included and discussed showing the acreages of different crops in 1930 on the several islands and making comparisons for 1906 and 1930 in the case of the larger islands.

Economic aspects of the grade and staple lengths of cotton produced in Oklahoma, R. A. Ballinger and C. C. McWhorter (*Oklahoma Sta. Bul. 212 (1933), pp. 55, figs. 21*).—This study, which covers the 1928 to 1932 crops, is a unit in the cooperative study being made by the Bureau of Agricultural Economics, U.S.D.A., and the State experiment stations in the cotton States. Tables and charts show by years for the United States, Oklahoma, and each of 11 sections of the State the number of bales and percentages of total crops of different grades, staple length, and tenderability on contracts; and for the State the percentages of bales of different grades and staple lengths ginned during specific periods of the season. The effects of variety, method of picking, climate, soil, and ginning in grade and staple length are discussed with tables and charts.

Of the cotton produced in Oklahoma during the period, approximately 50 percent was white middling or better as compared with over two thirds of the crop for the United States, 58.4 percent was $\frac{22}{32}$ in. or under in staple length as compared with 51.3 percent for the United States. Only 10.5 percent of the Oklahoma production was 1 in. or longer as compared with 24.2 percent for the United States. Of the Oklahoma production, 22.3 percent was untenderable on contracts as compared with 15.5 percent for the United States. Of the untenderable cotton in Oklahoma, 7.4 percent was due to grade, 11.8 percent to staple length, and 3.1 percent to both grade and staple length. Grades were lowest and staple lengths shortest in the western areas of the State. A larger part of the better grades and longer staple lengths than of the lower grades and shorter staple lengths was ginned in the early part of the season. The percentage of cotton harvested by snapping or pulling the burr off with the cotton increased from 20.2 percent in 1924 to 51.1 percent in 1931, this method being one of the principal ones in the western part of the State.

Variation in staple length produced in the different areas is associated fairly closely with the amount of rainfall and the varieties of cotton grown. Variation in grade is associated largely with weather conditions during harvest, method of harvesting, and in some cases with the type of soil.

Costs and practices in establishing walnut orchards in Oregon, A. S. Burrier and C. E. Schuster (*Oregon Sta. Bul. 315* (*1933*), *pp. 50, figs. 7*).—Records were obtained by the survey method for 68 groves consisting exclusively of bearing trees, 73 groves exclusively of nonbearing, and 63 mixed groves, comprising approximately 75 percent of the commercial acreage of bearing and 40 percent of nonbearing trees. Cost records covering the period 1919–29 were also obtained for 54 nonbearing groves. The extent of the industry, location of orchards, etc., are described. Analysis is made of the costs—first year and the second to the eleventh year—of an orchard, of the cost by operations, and of the major factors affecting the costs. The methods used in obtaining and analyzing the data are described.

The average cost per acre of establishing a young orchard (first 11 years) was $346.55, of which about 45 percent was cost of land. About 25 percent of the planting and growing cost came in the first year. Of the total growing costs, 17.9 percent was for man labor, 4.2 percent for horse work, 14.1 percent for trees, and 43.7 percent for interest on investment (5 percent). A total of 83.5 man-hours, 61.4 horse-hours, and 15.6 tractor-hours were required. About 49 percent of the cost was for overhead, interest, and taxes. Only 39.6 percent consisted of cash expenditures. About 50 percent of the orchards studied had annual costs within 30 percent of the average. Close planting increased the tree cost per acre and often led to permanent injury due to failure to thin at the proper time. Interplanting and intercropping lowered the walnut growing cost and added to the farm income during the period of orchard development.

The walnut production and consumption statistics indicate that a period of intensive competition for markets is probably at hand. Only suitable walnut soils should continue to be planted to walnuts. While interplanting and intercropping afford the chief opportunity for reducing the costs of establishing an orchard, care must be used in the selection of trees for interplanting or groves for intercropping so that they will not compete with the walnut trees for plant food and moisture.

Cost of producing honey in Oregon, A. S. Burrier, F. E. Todd, and H. A. Scullen (*Oregon Sta. Circ. Inform. 83 (1932), pp. [2]+13, fig. 1*).—This report summarizes the findings for the first year and the second year studied as to investment and cost of production in 1931, by items, for extracted and comb honey, the relation of costs to prices, and the effect of yield per colony to costs. Of the cooperators, 85 were engaged primarily in the production of extracted honey and 8 in the production of comb honey.

Grazing experiments [with beef cattle] (*Georgia Coastal Plain Sta. Bul. 21 (1933), pp. 53–56*).—The results are reported of 2 years' work with various pasture grasses and mixtures, in which different kinds and rates of fertilizer treatments were used.

[Sheep farming industry in Scotland] (*Glasgow: Scot. Natl. Devlpmt. Council, 1933, pp. 60*).—This is the report of the findings and recommendations of the Sheep Subcommittee to the Scottish National Development Council. The status of the industry, exports, imports, transportation, marketing of sheep and wool, breeding, management, improvement of grazing, etc., are discussed.

An economic study of 147 turkey flocks in Maryland, S. H. DeVault and M. Ingersoll (*Maryland Sta. Bul. 355 (1933), pp. 145–176, figs. 13*).—Data were obtained for 60 Western Shore and 87 Eastern Shore flocks for the period March 1, 1931, to April 30, 1932. Analysis is made for each area of the investment, income, costs of incubation, rearing, and marketing, all by items, and the net profit per flock and per 100 birds. Analysis is also made of the factors (all flocks) affecting profits; gross income and costs; feed costs; labor costs; capital investment; size of flock; method of incubation and breeding; mortality; and sanitation, feeding, and marketing practices.

The average size of flocks was 284 birds. The averages per bird were: Investment $2.59, receipts $4.49, costs $3.43, and net profit $1.06. Feed constituted over 50 percent, labor over 25 percent, and depreciation of breeding stocks 9.5 percent of the total cost. Incubation costs were 19.5 percent, rearing costs 76.5 percent, and marketing costs 3.9 percent of the total costs. Fifteen flocks showed no profit. The profit for 50 percent of the flocks ranged from 50 ct. to $1.49 per bird. A comparison of the 38 (average 274 birds) most and of the 36 (average 306 birds) least profitable flocks showed the following averages per bird, respectively: Receipts $5.27 and $4.16, costs $3.31 and $4.03, profits $1.96 and 13 ct., feed costs $1.51 and $1.75, labor costs 67 ct. and 95 ct., capital investment $1.08 and $1.90, and mortality percentages 29 and 39.

The largest flocks had the highest feed costs, the lowest labor costs, and the highest profits. Flocks brooded artificially were above the average in size and profit per flock. Direct sales to consumers, retailers, and for breeding, and sales of dressed birds were the most profitable.

A farm management study of 70 dairy farms in Montgomery County, Maryland, D. E. Watkins (*Maryland Sta. Bul. 356 (1933), pp. 177–222, figs. 5*).—Data regarding the farm business for the year 1929 of 70 representative farms were obtained. The general agricultural situation and the farms studied are described, with tables showing for the latter the utilization of land, crop acreages and yields, amount and value of crops sold, size of dairy herds, amount and value of labor paid and unpaid, capital, receipts, expenses, profits, and distribution of labor incomes. Other tables show data as to the various items of dairy enterprise costs and returns and the cost of raising heifers. Analysis is made of the effects of cost of milk production, rates of production, size of business, labor efficiency, dairy replacements, and balance of the farm organization on costs of production and income.

The averages for the 70 farms were for capital invested $31,968, receipts $8,508, expenses $6,717, and labor income —$127. Labor incomes ranged from over $3,000 to —$3,000 or less, 50 percent being minus, 26 percent from 0 to $1,000, 19 percent from $1,001 to $2,000, 23 percent from 0 to —$1,000, and 17 percent from —$1,001 to —$2,000. The average value per cow of milk sold was $222.20, or 84.1 percent of the total returns. The following table shows the effect of different factors on labor income, rate earned on investment, and cost of milk per gallon:

Table showing effect of different factors on labor income, rates earned on investment, and cost of milk per gallon

Factor	Change in factor		Labor income		Rate earned		Cost of milk	
	From less than—	To more than—	From—	To—	From—	To—	From—	To—
					Percent	*Percent*	*Cents*	*Cents*
Pounds milk production per cow	6,000	7,500	—$900	$824	—0.2	5.1	26.2	19.7
Value of milk sold wholesale per cow	$200	$250	—777	446	--------	--------	27.4	21.7
Crop index	90	110	—701	304	.3	3.5	--------	--------
Production index	90	110	—1,052	677	—.7	4.6	26.3	20.4
Number of cows per farm	15	30	15	—283	.8	3.1	24.2	23.0
Productive man work units:								
Per farm	500	900	62	—259	.9	3.1	24.7	22.8
Per man	180	225	—496	488	.5	4.5	25.0	21.0
Animal units other than work animals per man	7.1	9.5	—611	233	.3	4.1	--------	--------
Tons of milk produced per man	15	24	—929	730	—1.9	5.1	27.2	20.7
Output index	85	110	—1,104	1,079	—1.8	6.0	--------	--------
Acres per cow	7	10	333	—757	--------	--------	--------	--------
Gallons of milk per cow	75	130	—858	540	--------	--------	--------	--------

On farms where capital per man work unit and man work units per farm were below the average, the average labor income was $314. Where they were above the average, the labor income was —$1,244. Where capital was below and man work units above the average, the labor income was $451, and where capital was above and man work units below the average, the labor income was —$22. Where crop receipts and pounds of milk per cow were below the average, the average labor income and return on investment were —$1,000 and 0.4 percent. Where the receipts and pounds of milk per cow were above the average, the labor income and return were $777 and 4.8 percent, respectively. Where crop receipts were above and pounds of milk per cow below, the averages were —$319 and 1.3 percent, respectively, and where the receipts were below and pounds of milk above the average, the averages were $35 and 3.1 percent, respectively.

Cost and efficiency in dairy farming in Oregon, H. E. Selby, A. S. Burrier, and P. M. Brandt (*Oregon Sta. Bul. 318 (1933), pp. 98, figs. 41*).—The results are given of a 4-year study ended April 1, 1933, made to determine the average costs of producing milk and butterfat in the State, and the factors affecting such costs. The costs studied did not include those for young stock or for hauling or marketing milk. During the period studied 1,733 annual farm records were obtained from 574 farms, those for the first 3 years covering 22 counties, and those for the last year the 4 leading types of dairying in 12 counties.

Tables and charts show for the entire State, the Willamette Valley, the coast regions, and the irrigated regions, among other data, the costs, average prices received, capital requirements, financial returns, and the effects of yield of butterfat per cow, size of business, and labor efficiency on labor incomes for the entire farms. Formulas are computed for determining the cost of producing milk and butterfat in each region and for each type of dairying. Curves show the theoretical values for cows with different butterfat production per year.

Appendixes include a description of the methods used in the study, a table showing the costs of producing milk in the Portland milk shed, tables showing the cost of raising veal calves, and a review of other economic dairy studies, including a bibliography.

A study of the entire farm business of 537 of the farms the first year showed that the total farm investment averaged $22,804, of which 82 percent was in land and 10 percent in dairy stock. The average labor incomes per farm were for the Willamette Valley $134, the coast regions $820, and the irrigated regions $835.

The average costs per pound of butterfat of producing milk and butterfat for the State as a whole for the years ended April 1 were for 1930, 50 ct.; 1931, 40 ct.; and 1932, 36 ct. The average selling prices were 50, 41, and 31 ct., respectively. Feed constituted 52 percent of the cost, labor 27, depreciation of cows 8, use of buildings and equipment 7, and other items 6 percent. About 50 percent of the cost was immediate cash expenditures. The average costs of production per pound of butterfat for the year ended April 1, 1932, were in the Willamette Valley 39 ct., the coast regions 35 ct., and the irrigated regions 33 ct. On 7 percent of the farms the cost was under 25 ct., and on 5 percent over 55 ct.

The costs for the year ended April 1, 1933, were for the Willamette Valley market milk 39 ct., Willamette Valley churning cream 33 ct., coast regions cheese milk 30 ct., and irrigated regions churning cream 24 ct. The cost of separating milk was 14 ct. per 100 lb. of skim milk. Separator loss and the price differential between churning cream and manufacturing milk brought the total cost to 26 ct. per 100 lb. of skim milk.

Yield of milk and butterfat per cow was the most important factor affecting costs. On market-milk farms the cost per pound of butterfat averaged 52 ct. for herds producing 225 lb. per cow annually and 34 ct. for herds producing 375 lb.

Farms with the most pasture had the lower costs. Heavier grain feeding to high-producing cows was necessary and profitable, but the data show many low-producing cows were being fed too much grain. Feeding good hay and other roughage up to capacity was a most economical practice. Larger herds had definite advantages in efficiency of operation and lower costs, and with normal prices were the more profitable. With unfavorable prices, the risk of loss, however, was greater for the larger herds.

There was comparatively little correlation between value of cows and their yield or the cost of producing butterfat. On an average, pure-bred herds showed no advantage in cost of production of butterfat. The cost per pound of butterfat increased from 35 ct. for herds where less than 100 hours of man labor per cow per year were used to 51 ct. where over 250 hours were used. The total net cost per 100 lb. of milk increased from $1.23 for herds in the irrigated regions having a butterfat test of less than 4 percent to $1.58 for those with tests of over 5 percent, but the net cost per pound of butterfat decreased from 34 to 31 ct. In all regions, except the coast regions, fall freshening was the predominating practice and apparently the most profitable.

A study of the cost of horse and tractor power on Illinois farms, P. E. Johnston and J. E. Wills (*Illinois Sta. Bul. 395 (1933), pp. 265–332, figs. 13*).—

This study is confined to the aspects of the power problem concerning the individual farmer rather than to the phases of the problem bearing on the farming industry as a whole. Data were gathered from 1,351 central Illinois farms in 1930 and 1,599 such farms in 1931. Of the records obtained, 759 were for farms using horses only, 1,759 for farms using standard tractors, and 432 for farms using general-purpose tractors. The present power equipment of Illinois farms is described. Analysis is made for each type of farm studied of the types of power; size of farm; number of horses and crop acres per horse; number of horses per farm displaced by tractors; amounts of productive livestock; machinery investment; number of tractors and trucks; investment and duplication in tractors, horses, and equipment; cost of operating trucks; machinery costs; man labor, and combined man, horse, and machinery costs on farms of different sizes; and influence of amount of livestock and size of farm on the combined costs. Analysis is made of the operating costs—man labor, horse, machinery, truck, etc.—on different size farms of the three types; of the combined influence of amount of livestock and size of farms on costs; of the variations between farms; and of the influence of type of power on quality of work done and on farm earnings. Analysis is also made of tractor costs and horse costs.

The tractor-operated farms were considerably larger than the horse-operated farms, the crop acreage being less than 160 acres on 77.1 percent of the horse, 40.5 percent of the standard tractor, and 29.6 percent of the general-purpose tractor farms. The amount of productive livestock per acre was much greater on small than on large farms. It was approximately the same on horse and tractor farms comparable in size. The average number of horses displaced by a standard tractor ranged from 0.6 on farms of less than 80 crop acres to 3.4 on farms of 320 acres and more in 1930, and from 0.7 to 3.3 in 1931. The average displacement by a general-purpose tractor ranged from 1.7 to 4.7 horses in 1930 and from 1.8 to 5.2 horses in 1931. Combined machinery and horse investments and costs were both higher on the tractor than on the horse-operated farms. Slightly less man labor was used and the cost was slightly lower on the tractor farms. Combined labor, horse, and machinery costs averaged lowest on horse and highest on standard tractor farms, but the differences were slight and the variations within each power-type group great. Cash operating expenses were highest on tractor farms. No marked difference was found among the three types of farms as to amount of productive livestock kept, livestock efficiency, crop yield, or net earnings. The average per hour costs and hours of work in 1931 were: 2-plow standard tractors 63 ct., and 383 hr.; 3-plow standard tractors 76 ct., and 402 hr.; 2-plow general-purpose tractors 56 ct., and 514 hr.; and horses on horse farms 9.6 ct., and 652 hr.

Problems of elevator management, financing and organization, R. E. Post (*South Dakota Sta. Rpt. 1933, pp. 4, 5*).—A table shows the relation of average volume of grain handled, 1926–27 to 1930–31, to the average income, net income, and economic profit per bushel.

Corn futures (*U.S. Dept. Agr., Statis. Bul. 43 (1933), pp. 99, figs. 4*).—This publication supplements that previously noted (E.S.R., 66, p. 785) by presenting data for the Chicago Board of Trade, Chicago Open Board, and the Kansas City, Milwaukee, St. Louis, Minneapolis, and Omaha markets on volume of trading, open commitments, and prices from January 2, 1930, to December 31, 1932.

The marketing of Delaware early apples, H. S. Gabriel (*Delaware Sta. Bul. 185 (1933), pp. 29*).—The data were obtained from records of 77 farms, U.S. Department of Agriculture inspection reports, answers to a questionnaire by 98 hotels and 52 restaurants, accounts of sales in July and August in 25 units of a chain store in Philadelphia, and from 17 wholesale dealers in Philadelphia. Analysis is made of the varieties in Delaware and competing States, age of trees, size of orchards, cultural, harvesting, and marketing practices, prices, inspection reports, etc., for early apples in Delaware; of the varietal preferences, sources and sizes of purchases, uses, defects, prices paid, etc., for early apples; the sales and average prices at the chain stores in wealthy, industrial, Jewish, Italian, and colored sections of Philadelphia; and the popularity and defects of early apples reported by the Philadelphia wholesale stores.

Marketing Kentucky livestock by motor truck, C. D. Phillips (*Kentucky Sta. Bul. 344* (*1933*), *pp. 189–231, figs. 8*).—This is a study of the receipts from Kentucky by truck in 1930 and 1931 on the Cincinnati, Ohio, and Louisville and Evansville, Ky., markets, the distribution of such receipts by kinds of livestock and months, the length of hauls, the organization of the trucking business, trucking rates, and the advantages, disadvantages, and problems of livestock trucking.

Receipts from Kentucky in 1930 at Louisville constituted 54, 60, 65, and 79 percent, respectively, of the total receipts of cattle, calves, hogs, and sheep. The percentages at Cincinnati were 17, 46, 20, and 51 percent, respectively. At Evansville 86 percent of all stock was delivered by truck, 10 percent by rail, and 4 percent by boat. At Cincinnati 28.6 percent of the truck receipts were hauled less than 15 miles, 48.1 percent from 15 to 29 miles, and 17.1 percent from 30 to 44 miles. At Louisville the largest percentage came from 20 to 60 miles and at Evansville 92 percent came from less than 60 miles, with a larger percentage from less than 20 miles than at the other markets.

Seasonality in marketing was the chief difficulty in keeping trucks operating at capacity, especially those hauling to Cincinnati and Louisville where the lamb marketing season was short and the marketings large. Obtaining satisfactory loads of one kind of livestock from one farm and protection against the risks of losses and damages are important difficulties. There were no standardized trucking rates. Competition within a locality and road conditions were the most important factors affecting rates.

Yardage charges at each terminal market were higher on truck than on rail shipments. Commission charges were also higher at Cincinnati and Evansville. Trucked stock was usually not fed in the terminal yards.

Motor transportation of livestock in Ohio, G. F. Henning (*Ohio Sta. Bul. 531* (*1933*), *pp. 38, figs. 2*).—Data were obtained from 117 farmers and 113 truckers in four areas—a county in the Cincinnati territory, a county in the Cleveland territory, a county in rail territory about midway between the two cities, and a fourth area near Cleveland. Analysis is made for each area of the capacity, rack size, and age of the trucks; kinds, experience, business ability, etc., of truckers; size of loads handled to local and terminal markets; percentage of different kinds of livestock hauled; kinds and origin of loads; destination of livestock; methods of handling insurance carried; cost of operating trucks; and trucking rates.

Approximately 77 percent of the trucks in use were 1.5- or 2-ton trucks. The estimated average load hauled was about 4,200 lb. to local points and 7,000 lb. to terminal markets. Sixty-five percent of the loads were hogs. About 55 percent of the loads included only one kind of livestock and about 45 percent were loaded at one stop. Fifty-nine percent went to terminal markets. Truckers obtained 50 percent of their business from an area of approximately 32 sq. miles and on an average about 80 percent of their trucking income from hauling livestock. About 60 percent carried liability and property damage, 47 cargo, and 27 percent crippled and dead insurance. The estimated cost of operation averaged 8.75 ct. per mile for 1.5-ton trucks and 9.6 ct. for 2-ton trucks. About 75 percent of the hauling of livestock was for rates, but these varied greatly between the areas studied and within the same area. The rates to local points varied from $1 to $4 per trip, based on distance. Truckers desired an increase of 24 percent for hogs, 22 for cattle, 6 for calves, and 9.5 percent for lambs. Thirty-two percent of the truckers thought the present rates sufficiently high to enable them to buy new trucks to replace old ones worn out, but 45 percent did not think the present rate sufficient. During the past two years the average rates to both cities declined. The greatest declines were for hogs and sheep going to Cincinnati and hogs going to Cleveland.

Report on the marketing of live stock in Scotland, H. M. CONACHER (*Edinburgh: Dept. Agr. Scotland, 1933, pp. 129, figs. 6*).—Analysis is made of the Scottish and English demand for fat, store, and pedigree stock of different kinds; the Scottish supplies and imports of fat cattle, calves, store cattle, dairy stock, sheep, and hogs; the organizations for marketing and slaughtering; and movements of prices of livestock and meats of different kinds.

The operation and results of the hog production control plan in Denmark, H. E. REED (*U.S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., F.S. 59 (1933), pp. [2]+33*).—The development and organization of the hog and bacon industries, and the conditions necessitating hog-production control in Denmark are described. The legislation providing for and the objects and the financing of the control plan; price-fixing; prorating and allotment of hog cards; sale and disposal of surplus pork and bacon; the results and effects of the plan on slaughter, consumption, and prices of hogs, and on the dairy and feed industries; and the probable short and long-time effectiveness of the plan are discussed.

A study of egg production per hen in central Utah, O. V. WELLS and M. CLAWSON (*Jour. Farm Econ., 15 (1933), No. 4, pp. 633–644, figs. 2*).—Using data obtained in the study previously noted (E.S.R., 70, p. 700), two correlation analyses are made of the relation to egg production per bird of amount of feed fed per bird and percentage of mash in the ration, one being for 25 pullet flocks and the other for 86 mixed flocks. In the case of the mixed flocks the additional factor, percentage of pullets in flock, was also included.

The coefficient of determination for the pullet flocks was 0.372 and for the mixed flocks 0.55. The standard errors of estimate were for pullet flocks 13.88 eggs and for mixed flocks 14.5 eggs per hen.

[Milk industry in the State of New York], edited by L. SPENCER (*Albany: State, 1933, pp. 473, pls. 11, figs. 29*).—This is the report of the joint legislative committee appointed in 1932 "to investigate the causes of the decline of the price of milk to producers and the resultant effect of the low prices upon the dairy industry and the future supply of milk to the cities of the State, to investigate the cost of distribution of milk and its relation to prices paid to milk producers, to the end that the consumer may be assured of an adequate supply of milk at a reasonable price both to producer and consumer."

Included are the findings regarding (1) the importance of the milk industry, the complexity of the milk problem, the dairy situation in the State, and the effects of low milk prices, including the effect on incomes and expenditures of farm families and on the consumer; (2) cooperative organizations of milk producers and the organization of the business of milk distribution in different cities and sections of the State; (3) the distributors' spread in the New York metropolitan area and in upstate cities; (4) the distribution of milk through retail stores in New York City; (5) the remedies proposed by witnesses for existing conditions; and (6) the conclusions and recommendations of the committee.

Appendixes include a discussion of the legal aspects of milk control, by J. T. Cross (pp. 269–295); summaries of previous milk investigations in New York and cities of the State and in New England and Canada (pp. 297–336); a number of contracts used in New York in the purchase or sale of milk (pp. 337–363); the legislative bills sponsored by the committee (pp. 365–382); and the forms used by the committee in compiling data on distribution costs (pp. 383–473).

Retailing milk in Laconia, E. H. Rinear and H. C. Moore (*New Hampshire Sta. Bul. 272 (1933), pp. 20, figs. 3*).—This bulletin reports the findings of a study made in 1932 to determine whether more efficient methods of distribution with resulting larger returns to producers could not be used in Laconia, a city of 12,400 people.

The average price of milk sold by producer-distributors was 9.6 ct. per quart. Current costs averaged slightly over 0.4 ct., and truck delivery costs 0.8 ct. per quart. The average net wholesale price of milk was 4.1 ct. per quart, leaving a return of 4.2 ct. per quart for labor in retailing. In retailing milk, the 54 producers traveled 596 miles per day. Opportunities for reducing truck costs and increasing efficiency in distribution are pointed out.

Quality of market cream in Illinois: Factors affecting it and methods for improvement, C. A. Brown (*Illinois Sta. Bul. 396 (1934), pp. 333–396, figs. 6*).—Data were obtained from representative cream stations in 52 counties of the State. Replies to a questionnaire regarding station practices and equipment were obtained from about 1,000 stations. The acidity and grade of cream were determined for nearly 1,600 producers in July and August 1930 and for 1,900 producers from January to March, inclusive, 1931. Each producer in the summer period was interviewed regarding production facilities and methods. Information regarding cream and butter quality and experience with grading plans and other improvement methods was obtained by correspondence with persons in other States and Canadian provinces.

Of the cream tested, in the northern third of the State that from 53.7 percent of the patrons in the winter and 97.6 percent in the summer had an acidity of 0.6 percent, or less, and that from 47.1 percent and 85.7 percent, respectively, graded special or first grade on acidity and flavor. In the central section the percentages were 56.0, 83.6, 44.8, and 71.7, respectively, and in the southern section 34.7, 72.6, 25.4, and 57.2, respectively. Only 24 percent of the producers reported any cooling medium; only 1.3 percent used running water, and only 15.7 percent cooled cream before pouring it into storage cans. Of the cream not cooled 23 percent of that delivered three times a week, 39.1 percent of that delivered twice a week, and 58.5 percent of that delivered once a week showed over 0.6 percent acidity. Size of herd, distance to market, condition of roads, and season of year affected frequency of delivery. There was no material difference in the butterfat content in winter and summer cream.

Of the cream handled by 941 stations in September 1930, 44.5 percent was handled by stations with outputs of 2,000 lb. or less, and 61 percent by stations handling cream as a minor business. Only 15 percent were engaged exclusively in handling cream. Of the cream of 783 stations 17.4 percent was in transit an hour or less, 52.5 percent three hours or less, 76.8 percent six hours or less, and 95.4 percent not over twelve hours.

The study of results in other States showed buying on grade to be the most effective method of improving the quality of cream.

Prices and consumption of milk in specific cities as related to industrial pay rolls and other economic factors, R. W. Bartlett (*Illinois Sta. Bul. 397 (1934), pp. 397–480, figs. 34*).—Tables and charts are included and discussed showing the relations between wholesale prices of milk and prices of dairy rations in Illinois, 1910–33, inclusive; income of nonagricultural consumers and retail expenditures for butter in the United States, 1920–33, inclusive; pay rolls 1929 and 1933 in specific industrial manufactures in the United States and pay rolls of all reporting and manufacturing industries in the United States and Illinois, 1923–33, inclusive. Other tables and charts show the indexes of factory pay rolls 1932 and March, August, and October 1933; per capita production of durable and consumption goods in the United States, 1899–1932, inclusive; the proportion of Illinois wage earners in consumption and durable goods industries in 1927; the importance of different types of industries in 1929; and the changes in industrial pay rolls, 1929–32, in fourteen Illinois cities. The changes and trends in milk consumption in different cities of the United States and Illinois, the effects of declining population curve on the potential market for milk and cream, the possibility of increasing per capita consumption of milk, the land and labor necessary to supply an increased volume of milk, and the influence of store sales on per capita consumption are discussed. The competition of evaporated milk and other foods on the fluid milk under different price and pay roll conditions are discussed in greater detail.

The changes in consumers' expenditures for butter, 1920–32, were practically the same as those in the indexes of industrial pay rolls. Declining consumers' purchasing power since 1929 has been accompanied by a significant decline in the market demand for milk. Major reductions in purchasing power and important reductions in the prices of substitute foods unaccompanied by reductions in milk prices have been followed by marked decrease in milk consumption. Competition among stores has been one of the most influential factors in bringing about rapid changes in retail prices of milk and cream in response to changes in consumers' purchasing power.

The consumption of dairy products in seven metropolitan cities of New Jersey, C. B. HOWE and W. C. WAITE (*New Jersey Stas., 1932, pp.* [2]+*124, figs. 3*).—This, the third bulletin of the series previously noted (E.S.R., 65, p. 83), made in cooperation with the U.S.D.A. Bureau of Agricultural Economics, reports the findings in a study of 2,184 urban families in the New Jersey portion of the New York City metropolitan milk district and the effects of such factors as race or nationality, length of residence in the United States, income and capital per capita, and size and composition of family on the per capita consumption of different dairy products.

In terms of whole milk equivalent, negroes and Italians consumed relatively small per capita quantities of dairy products, being 1.8 and 1.58 lb. per day, respectively, as compared with 4.07 lb. for native white, 3.75 lb. for Irish, and 3.32 lb. for German families. Italian families were heavy consumers of cheese, but relatively small consumers of milk and butter. Negroes preferred buttermilk to sweet milk. Jews were heavy consumers of bottled milk, but such consumption curtailed the use of other dairy products. Jews and Poles were fond of sour cream. Length of residence of families of foreign origin resulted in less modifications in consumption habits than generally supposed. While practically all the families used milk and a considerable proportion used butter, the proportions using other dairy products were much less. Per capita consumption of dairy products increased as per capita income increased, but in the case of milk and cheese the increase was confined to the two income groups below $700. As soon as income permitted grade A milk was substituted for grade B. Families with children used more fluid milk and also a larger proportion for drinking. The per capita consumption of children by drinking was smaller in the larger families. There was active competition between grades A and B milk and between evaporated and bottled milk. Families purchasing milk from both the wagon and the store used more per capita than those purchasing from either source alone.

Selected farm expenditures, cooperative marketing and purchasing, and farm facilities (*U.S. Bur. of the Census, 15. Census, 1930, Agr., pp. 43, figs. 10*).—This is chapter 7, volume 4, General Report on Agriculture for the Fifteenth Census (1930) of the United States, prepared under the supervision of W. L. Austin. It includes statistics, by States and geographic divisions, on expenditures for farm labor, fertilizer, feed, electric light and power purchased, and farm implements and machinery; cooperative marketing and purchasing by farmers; farm motor equipment and home conveniences; and kind of road adjoining farms.

Farm accountancy statistics for 1929–30 [trans. title] (*Inst. Internatl. Agr. [Roma], Comptab. Agr. Rec. Statis. 1929–30, pp. LXXXVII+616, figs. 20*).—This continuation of the series previously noted (E.S.R., 69, p. 612) includes 19 European countries and the Province of Punjab, India. The tables and notes are given in French and English.

The crop and livestock reporting service of the United States (*U.S. Dept. Agr., Misc. Pub. 171 (1933), pp. 104, figs. 69*).—"This description of the methods used by the Division of Crop and Livestock Estimates of the Bureau of Agricultural Economics in collecting and analyzing statistical data relating to crop and livestock production and related subjects has been prepared by the Washington statistical staff of that Division to meet a widespread demand for information concerning the operation of the United States crop-reporting service."

The development, present scope, and sources of information for crop and livestock reports, composition, work, and publications of the Crop Reporting Board, the Federal laws governing crop reports, and the development of check information are described. The methods of collecting and analyzing the data for estimates of acreages and yields per acre, for forecasting crop production, for estimates of farm value, gross income, and cash income from farm production, and for reports on field crops, cotton, fruits, truck and canning crops, livestock, dairy, poultry, and farm prices are described and discussed.

An appendix includes selected schedules and forms used by the service.

Crops and Markets, [January 1934] (*U.S. Dept. Agr., Crops and Markets, 11 (1934), No. 1, pp. 32, figs. 3*).—Included are reports, estimates, summaries, charts, maps, etc., of the usual types.

Index numbers of production, prices, and income, J. I. Falconer (*Ohio Sta. Bimo. Bul. 166 (1934), p. 29*).—The table previously noted (E.S.R., 70, p. 696) is brought down through October 1933.

Coffee in 1931 and 1932 (*Le Café en 1931 et 1932. Roma: Inst. Internatl. Agr., pp. VII+232, figs. 12*).—Statistics are given as to production, consumption, and prices. The economic situation as regards the coffee industry in each of the producing countries, the diseases and pests of coffee, and the preparation of coffee are discussed. The research work on the general technic of coffee culture and the ecological conditions are reviewed.

World trade barriers in relation to American agriculture (*U.S. Senate, 73. Cong., 1. Sess., Doc. 70 (1933), pp. IX+540, figs. 30*).—This is a report prepared by the U.S.D.A. Bureau of Agricultural Economics and transmitted to the Senate of the United States in response to S.Res. 280, 72d Cong., 1st sess. It "shows the effect on American agriculture of trade barriers and other measures designed to aid farming in foreign countries. It also suggests that various other trade restrictions in their present extreme form, debt payments, and international lending in general have had a profound influence on our agriculture in the past decade and a half."

Part 1 (pp. 13–51) discusses the recent trends and present position of American agricultural exports, the effects of trade barriers directly applied to farm products, foreign purchasing power for such products as affected by American foreign lending and American tariff policy, and the world trade barriers during the periods 1918–25, 1925–29, and since 1929.

Part 2 (pp. 53–141) describes "the principal types of government measures affecting prices and production of agricultural commodities in the world today, together with an analysis of the consequences which tend to result from their application", dividing them into three classes—those affecting imports, exports, and production otherwise than through regulation of imports or exports. It also discusses the agrarian policies of selected deficit countries (United Kingdom, Germany, France, and Italy) and selected surplus countries (British Dominions, the Danubian countries, and the Union of Soviet Socialist Republics).

Part 3 (pp. 143–288) discusses the effects of trade barriers and related measures upon the prices in the United States of wheat, hog products, tobacco, fruit, cotton, dairy products, and sugar.

An appendix (pp. 289–540) describes the agricultural price-supporting measures in 38 countries.

Agricultural outlook for Illinois, 1934 (*Illinois Sta. Circ. 417 (1934), pp. 31, figs. 7*).—The general agricultural situation in the United States and Illinois and the outlook in Illinois for different feed crops, hay, feedstuffs, other field crops, livestock, livestock products, dairying, fruits, vegetables, and forestry are discussed. The discussion is based largely on U.S.D.A. Miscellaneous Publication 182, previously noted (E.S.R., 70, p. 696).

Australia as producer and trader, 1920–1932, N. WINDETT (*London: Oxford Univ. Press, 1933, pp. XVI+320, figs. 2*).—The production, economic policies, and international trade of Australia are discussed in chapters on the post-war development of Australian industries and overseas trade; raw wool; meat, hides and skins, and dairy products; wheat; sugar, fruit, and wine; minerals; iron and steel; electrical manufactures, machinery, and motor vehicles; textile manufactures; and the direction of Australian overseas trade, with special reference to countries in the Pacific.

RURAL SOCIOLOGY

County consolidation in Colorado, S. R. HECKART and G. S. KLEMMEDSON (*Colorado Sta. Bul. 406 (1933), pp. 57, figs. 11*).—This bulletin discusses the importance and need of county consolidation, the factors involved, what is an economic unit of county government, the advantages and disadvantages in consolidation, etc. Two plans of county consolidation are discussed, and a plan for reducing the number of counties in Colorado from 63 to 22 outlined and the advantages illustrated, using the proposed San Luis Valley County as an example.

The growth and decline of South Dakota trade centers, 1901–33, W. F. KUMLIEN (*South Dakota Sta. Rpt. 1933, p. 34*).—Some of the findings from this study are briefly noted.

Virginia: Economic and civic, edited by R. L. HUMBERT, C. W. NEWMAN, ET AL. (*Richmond: Whittet & Shepperson, 1933, pp. XXI+427, figs. 7*).—Of this book, prepared by the Virginia Polytechnic Institute in collaboration with the Virginia State Chamber of Commerce and published by the Chamber of Commerce as a contribution to an economic and social survey of Virginia, the Governor of the State, in a foreword, says: "Recent advances in government and industry have revealed a new Virginia. . . . The facts behind this new Virginia are presented authoritatively, and for the first time in comprehensive form, in this work. . . . It presents an exceptional basis for an understanding of the Virginia of today, and of the opportunities for material progress."

Specialists of the Virginia Polytechnic Institute and representatives of other State institutions and agencies and of the U.S. Department of Agriculture, State officials, and many others are responsible for the subject matter of this book, which is a comprehensive compendium of information regarding the natural resources, progress, and possibilities of the State, with special emphasis on governmental and industrial development, but containing a chapter devoted exclusively to agriculture and references to other matters such as land features, climate, forests and forestry, and public improvements of various kinds having an important and in some cases very direct bearing on agriculture and rural welfare.

It is pointed out that, notwithstanding the rapid industrial development of the State in recent years, "Virginia is primarily an agricultural State and the welfare of its population, urban as well as rural, depends to a large extent upon the general prosperity of the farming people. The number of people living on farms in Virginia in 1930 was 948,746, this total representing nearly 40 percent of the population of the State in that year." The total land area in farms, however, decreased from 19,495,636 acres in 1910 to 16,728,620 acres in 1930, and the gross farm income decreased from $210,621,000 in 1925 to $163,330,000 in 1930.

Attention is called to the highly diversified character of the soil, climate, and agriculture of the State and to significant changes in rural life as affected by economic and social factors.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A study of the extension service in agriculture and home economics in Iowa, J. B. Davidson, H. M. Hamlin, and P. C. Taff (*Ames: Iowa State Col., 1933, pp. XIII+237, pl. 1, figs. 8*).—This is a report of a committee appointed by the president of Iowa State College. "The survey as planned and carried out was essentially a study of the objectives, organization, relationships, and results of the extension work." The material is dealt with under the following headings: Movements leading to the establishment of the extension service, the need and objectives of extension service in agriculture and home economics, the field and functions of extension, the relationship of the extension service to research and resident instruction, administration of the extension service, the specialist staff, the field agent system, the county extension organization, relationships with the public schools, other extension service relationships, a study of methods of extension instruction, extension service in home economics, boys' and girls' 4-H clubs, and extension research.

Home demonstration work, G. E. Frysinger (*U.S. Dept. Agr., Misc. Pub. 178 (1933), pp. [2]+14, figs. 9*).—The scope of home demonstration work, the organization of a community for such work, the planning of a community program, the methods used by home demonstration agents, and the efficiency of rural women as leaders are described.

The earning ability of farmers who have received vocational training, W. S. Newman (*Fed. Bd. Vocat. Ed. Bul. 167 (1933), pp. IX+44, fig. 1*).—This study, made to ascertain the extent to which high school vocational training in agriculture has influenced the earnings of farmers, is based upon data obtained in 1930 and 1931 covering 153 Virginia farmers, 101 of whom had had vocational training. All the farmers studied had left school prior to 1926, had completed 2 yr. of high school work satisfactorily, and had farmed in 1926 and continuously up to the time of the study, but had not farmed prior to 1920. None had attended college. The former vocational students' high school work must have included 2 yr. of vocational agriculture, and that of the nonvocational students none. The two groups compared closely in location and size of farm, type of farming, age, nationality, physical condition, years and grades in high school, farm experience since leaving high school, acres cultivated, tenure, and capital invested. In the analysis the farmers were divided by type of farming as general, tobacco, peanut, dairy, and truck.

The vocationally trained groups had average labor incomes as follows: General farming, $444, tobacco, $196, peanuts, $474, dairy, $2,395, and truck, $793, as compared with $228, $85, $410, $1,669, and $352, respectively, for the nontrained groups. The trained groups secured higher yields in all the enterprises except wheat, in which the untrained groups excelled by 0.2 bu. per acre, and cotton and Burley tobacco, where the excesses were insignificant because of the small acreage. The trained farmers showed a better balanced farm business, and on the whole were twice as active in cooperative buying and selling and other farm organizations and in using approved sources of agricultural information.

Handbook on teaching vocational agriculture, G. C. Cook (*Danville, Ill.: Interstate Ptg. Co., 1933, pp. 406+[4], pls. 13, figs. 8*).—"The purpose of this book is of a twofold nature—first, it is of primary interest to supervisors, teacher trainers, trainees, and teachers in the field of vocational agriculture; and second, it is of value to superintendents, high school principals, school boards, and any others interested in vocational work."

The aims, importance, and effectiveness of vocational education in agriculture; classroom equipment, texts, reference books, programs, curriculum, class organization, instructional processes, etc.; the importance, classification, scope, and ownership of supervised farm practice; the selection of enterprises and practices to follow in planning projects, keeping records, and supervising and giving credit for the farm practice program; the choice of the type of farm mechanics shop, shop organization, equipment, etc.; farm mechanics courses and the conducting of such courses, etc.; and miscellaneous activities, including the summer program of work for instructors, student demonstrations, vocational agricultural fairs and exhibits, evening schools and part-time work, professional improvement of teachers, etc., are dealt with.

An appendix includes lists of texts, reference books, magazines, publications, sources of aids and illustrative materials, tool and junior fair premium lists, texts of vocational laws, a 4-yr. program in farm mechanics, etc.

Suggestions for teaching the job of grading feeder and stocker steers in vocational agriculture classes, W. A. Ross (*Fed. Bd. Vocat. Ed. Leaflet 4 (1933), pp. 22, figs. 7*).—This circular, prepared in cooperation with the U.S.D.A. Bureau of Agricultural Economics, is designed to assist teachers of vocational agriculture in training present and prospective farmers.

Reorganizing the individual farm business, J. H. Pearson (*U.S. Dept. Int., Off. Ed., Vocat. Ed. Monog. 18 (1933), pp. III+27*).—This monograph, prepared in cooperation with the Bureau of Agricultural Economics, U.S.D.A., for the assistance of teachers, teacher trainers, and supervisors of agricultural education, outlines the procedure in organizing and carrying out a functional course on farm reorganization in evening agricultural schools.

The home project in homemaking education, J. H. Blake and F. Fallgatter (*Fed. Bd. Vocat. Ed. Bul. 170 (1933), pp. XII+179, figs. 12*).—The purpose of this bulletin is "to furnish suggestive materials in the form of (1) present practices in the vocational schools in the program of home projects, many of which are still in an experimental stage, (2) some ways and means for evaluating these present practices, (3) questions to stimulate further thinking on the philosophy and objectives underlying the entire program of home-making instruction." It sets forth the needs for home projects and their service in attaining present-day objectives for home economics instruction, and discusses the selection and planning of a home project, teacher guidance, the adjustment of the preliminary plan, special difficulties, the factors and features involved in completing a project, the administration of a home project program, how school superintendents and administrators can assist in the development of and State supervisors promote and guide the home project program, and how teachers can be trained for guiding home projects.

FOODS—HUMAN NUTRITION

A century of progress in the chemistry of nutrition, H. C. Sherman (*Sci. Mo., 37 (1933), No. 5, pp. 442–447*).—In this paper, presented at the Chicago meeting of the American Chemical Society, September 1933, the author has divided the 100 years under discussion into three periods of approximately a third of a century each. The first period is marked by the beginning of the chemistry of nutrition under Liebig and its development under Voit and at the end of the period under Johnson, Atwater, and Osborne. Significant contributions of the second period are those of Pasteur in establishing the principle that life processes are amenable to successful investigation by chemical methods; of Osborne and others on the chemistry and nutritional significance of proteins; of Rubner, Atwater, and others on the energy relations of nutrition; of Eijkman on nutritional deficiency diseases; and of the agricultural experiment stations and the U.S. Department of Agriculture on the nutrition of plants, animals, and man.

The third period is discussed not from the point of view of individuals, but of six steps in scientific development. These are essentially as follows: (1) Quantitative studies of energy relations; (2) protein chemistry of nutrition with its twofold development of the dispensability and indispensability of amino acids and the recognition that several of the catalysts essential to energy metabolism are derivatives of amino acids; realization of the importance (3) of mineral elements, (4) of the vitamins, and (5) of the interrelationship between different nutritional factors; and (6) "the principle that in the chemistry of nutrition our ultimate concern is essentially the nutritional reactions of the living body as a whole."

The foundations of nutrition, M. S. Rose (*New York: Macmillan Co., 1933, rev. ed., pp. XI+630, pl. 1, figs. 102*).—In this revision of the volume noted previously (E.S.R., 59, p. 188), the part relating to the vitamins has been revised and enlarged, with a separate chapter devoted to each. The material on energy, protein, and mineral elements has also been expanded and subdivided into a larger number of chapters. The table in the appendix giving food values in shares, and as far as possible in vitamin units, has been extended and simplified.

[Nutrition experiments at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1933, pp. 82, 83, 84, 85*).—Progress reports are included on studies by C. M. McCay and H. Morgan on the effect of highly purified cellulose upon intestinal movement and the excretion of calcium, phosphorus, and nitrogen in human beings; by McCay, M. F. Crowell, H. S. Osgood, and S. A. Asdell on the extension of life span in adult experimental animals by diet control; and by McCay on the use of the cockroach as a test animal for vitamin B determinations.

Foods, M. M. Justin, L. O. Rust, and G. E. Vail (*Boston: Houghton Mifflin Co., 1933, pp. XXI+569, figs. 80*).—This volume of the Riverside Home Economics Series, edited by A. F. Blood, is the result of many years' experience in the teaching and administration of food courses to college freshmen. The subject matter is arranged under the unit plan in five units entitled Securing and Maintaining a Good State of Nutrition; Common Foods—Their Preparation and Use; Planning, Preparing, and Serving Meals; Marketing for Our Food; and Preserving Food for Future Use. An appendix contains rules of conduct, table service, table manners, and care of dishes and utensils.

Practical food inspection.—II, Fish, poultry, and other foods, C. R. A. Martin (*London: H. K. Lewis & Co., 1933, vol. 2, pp. VII+249+32, figs. 57*).—This companion volume to the one noted previously (E.S.R., 70, p. 242) deals with the inspection of fish, poultry and game, fruit, vegetables, and cereals, canned foods, milk and milk products, and miscellaneous foods. Chapters are also included on food poisoning and legal procedures [Great Britain] in food inspection. A glossary of terms not included in the glossary given in volume 1 is appended.

Hows and whys of cooking, E. G. Halliday and I. T. Noble (*Chicago: Univ. Chicago Press, 1933, [2. ed., rev.], pp. XVIII+252, pl. 1, figs. 83*).—In this revision (E.S.R., 60, p. 89), alteration and additions have been made throughout the text and two chapters have been added.

"One of the new chapters is on meal preparation from the beginner's standpoint. It emphasizes the fact that efficiency in this as in any other occupation requires practice, but shows how the practice period may be reduced to a minimum through suitable selection of foods and by well-thought-out plans.

"The other chapter on beef includes a discussion illustrated by photographs and drawings of the properties which enable one to identify grades and cuts of beef; the approximate weight as purchased, and the number of servings to be obtained from retail cuts of a suitable size for a small family; and detailed directions for cooking all of the cuts described." In the preparation of this chapter the authors have had the assistance of representatives of the National Live Stock and Meat Board and the Institute of Meat Packers, as well as many others.

Study of tenderness in pastries made from flours of varying strengths, M. C. Denton, B. Gordon, and R. Sperry (*Cereal Chem., 10 (1933), No. 2, pp. 156–160*).—A method is described for testing the suitability of various types of flour for pastry making by making wafers from a standard formula, baking them under specified conditions, and testing them for tenderness by breaking strength determinations. A few tests are reported showing the effect of certain factors on the test and its accuracy, as determined from the average breaking strengths for blends of known flours differing widely in strength.

In vitro digestion of the starch of long and short cooked cereals, I. T. Noble, M. Dean, M. Wing, and E. G. Halliday (*Cereal Chem., 10 (1933), No. 3, pp. 243, 244*).—Samples of 2 precooked cereals and 5 which had been heated only enough to sterilize the grain were tested for their digestibility in vitro raw and after cooking for 20 and 90 min., respectively. The tabulated results in terms of maltose formed by 1-hr. digestion, representing the averages obtained from 3 or more separate cookings with at least duplicates for each cooking, showed striking similarity for the 20- and 90-min. cooking periods for all of the cereals, with much higher and more consistent values than for the raw cereals. This is thought to indicate that although raw cereal starches may be fully digested they are not converted into sugar as readily as when cooked.

Non-survival of red mold of the Monilia sitophila group at baking temperature, C. B. Morison (*Cereal Chem., 10 (1933), No. 5, p. 462*).—Conidia and ascospores of *Monilia* sp. isolated from moldy bread survived 30 min. at 50° C., but were killed by 20 min. at 60°, or 10 min. at 70°. Loaves baked from infected dough for 30 min. at 220° showed no evidence of mold after 5 days' incubation.—(*Courtesy Biol. Abs.*)

[Potato studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1933, pp. 18, 19*).—This progress report summarizes the results obtained in a continuation of studies on the effects of storage on the vitamin C content and of various factors on the cooking qualities of Wyoming-grown potatoes (E.S.R., 68, p. 854).

Effect of pears, peaches, apricots, and dried sulfured apricots on urinary acidity, L. G. Saywell (*Jour. Nutrition, 6 (1933), No. 4, pp. 397–406*).—The author's previous studies (E.S.R., 70, p. 718) on the effect of various foods on urinary acidity have been extended to fresh Bartlett pears, canned peaches and apricots, and dried sulfured apricots. The pears were ingested in quantities of 1,000 g, canned peaches and apricots 1,260, and dried sulfured apricots 300 g daily as supplements to the basal diet.

On the basal diet alone the pH of the urine ranged from 5.65 to 6.05, with a general equilibrium at 5.8–5.7. In all cases there was a marked increase in pH values following the addition of the fruits to the diet, averaging approximately 0.7 unit for the pears, 0.85 for the canned peaches, 1.2 for the canned apricots, and 1.45 units for the dried sulfured apricots. Corresponding decreases in ammonia excreted and total acidity of the urine were noted.

The alkaline reserve, which had been lowered slightly by the basal diet, was restored to normal by the pears, increased to slightly above normal by the peaches, and very greatly increased by both types of apricots. The average oxidation of the organic acids of the pears was approximately 94.9 percent, of the peaches 94.2, canned apricots 94.9, and dried apricots 94.6 percent. It is considered of interest that the percentages of organic acids oxidized is so constant regardless of the quantities digested, and that the added inorganic sulfur in the apricots did not reduce markedly the basic effect of the apricot on urinary acidity.

The effects of certain fruits on urinary acidity (*Jour. Amer. Med. Assoc., 101 (1933), No. 17, p. 1320*).—In this editorial comment on the series of studies by Saywell noted above, the comment is made that with respect to the function of fruits as potential alkalies in the body "each edible fruit really needs to be tested in the crucible of the body."

The laxative principle in prunes, G. A. Emerson (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 2, pp. 278, 281, fig. 1*).—As a result of tests by various methods of the cathartic efficacy of extracts of prunes prepared in different ways, the author concludes that "the laxative properties of prunes are not due entirely to colloidal or emollient effects in the intestine, as has been previously supposed, but would seem to depend also on the presence of an agent soluble in water, alcohol, and pyridine. This active principle in prunes, which is broken down by strong hydrolysis, has otherwise certain chemical and physiological properties similar to dihydroxyphenylisatin and to caffeic and chlorogenic acid."

Effect of cranberries on urinary acidity and blood alkali reserve, C. R. Fellers, B. C. Redmon, and E. M. Parrott (*Jour. Nutrition, 6 (1933), No. 5, pp. 455–463*).—In this investigation at Massachusetts State College, 6 male subjects from 22 to 27 yr. of age were used in one or more of three experiments to determine the effect of ingested cranberries on the composition of the urine and the blood alkali reserve. The first experiment was designed to observe the effect of the ingestion of large quantities of cranberries, the second the rate of recovery from the effects produced by these large quantities, and the third the effect of small normal servings of cranberries. Two subjects were used for the first and second and four for the third experiment.

The basal diet used, with minor exceptions, in all experiments consisted of Graham crackers 300 g, milk (3 pt.) 730, Iceberg lettuce 120, heavy cream (½ pt.) 225, eggs (2) 140, and apple (1) 150 g daily. In the first experiment, after 5 days on the basal diet alone, cranberries in the form of whole or strained sauce were ingested in quantities increasing from 100 g on the first to 300 g on the fifth and final day of the experimental period. In the second series, after 2 days on the basal diet, 254 g of cranberries were ingested, and analyses made of the blood and urine after 2, 12, 36, and 60 hr. The third experiment was run in two series in two different years. In the first of these, after 2 days on the basal diet, 22 g of cranberries were ingested daily for 3 days and in the second the experiment lasted 4 days, with 32.7 g of cranberries on the first 2 and 54 g on the next 2 days, followed by a single day on the basal diet.

In all of the experiments the data on volume, specific gravity, pH, creatinine, and phosphorus of the urine showed no important changes. Both titratable and organic acids were increased to a slight extent, amounting to not over 15 percent on doses of 100 g or more. The quantity of hippuric acid in the urine increased roughly in proportion to the quantity of cranberries ingested, and the greater part of it appeared in the urine within 24 hr. Since cranberries contain from 0.05 to 0.1 percent benzoic acid, it is concluded that the balance of hippuric acid probably came from quinic acid. Urea nitrogen in the urine was perceptibly decreased following the ingestion of large amounts of cranberries and the ammonia nitrogen slightly increased. The decrease in urea nitrogen is thought to be due to the additional quantities of glycine required for the conjugation of the benzoic acid in the body.

The CO_2 combining capacity of the blood decreased from 30 to 60 percent following the ingestion of the larger amounts of cranberries, but there was no demonstrable decrease in blood alkali reserve as thus determined following the ingestion of the smaller quantities representing ordinary servings. "It thus appears that the blood buffer substances are able to maintain the alkali reserve and pH even in the presence of moderate amounts of free acids. Though cranberries in normal servings do not lower the blood alkali reserve, they apparently do not leave an alkaline residue in the body in spite of the slight alkalinity of the ash."

Food value of cranberries and cranberry sauce, C. R. Fellers (*Forecast, 47 (1934), No. 2, pp. 69, 84*).—A popular presentation of the principal findings in the investigation noted previously (E.S.R., 69, p. 142).

Quick freezing of vegetables for market (*New York State Sta. Rpt. 1933, pp. 95, 96*).—This progress report includes summaries of studies of the effect of increasing maturity of sweet corn on the yield of usable ears and the quality of the frozen product (both cut corn and corn on the cob), and of blanching upon the time during which peas can be kept without deterioration before processing.

Preservation of perishable foods by new quick-freezing methods, C. Birdseye (*Jour. Franklin Inst., 215 (1933), No. 4, pp. 411–424, figs. 3*).—This is a general discussion of the principles involved in the quick-freezing of foods, the factors which must be considered in the freezing, transportation and use of the products, the health values and costs of quick-frozen foods, and the future

Dietetics for the clinician, M. A. BRIDGES (*Philadelphia: Lea & Febiger, 1933, pp. XVI+17-666*).—The first part of this volume, which is designed as a reference work for the general practitioner, the hospital interne, and the dietitian, deals with general considerations. Under this heading are sections on the mechanics of digestion, the physiology in chemistry of digestion (contributed by C. P. Sherwin), vitamin factors in diet (contributed by H. E. Marks), foods, and food from the culinary standpoint (contributed by R. L. Gallup). In part 2, Diseases and Their Diets, each disease is discussed from the standpoint of the physiological and pathological needs of the patient, foods to be omitted from the diet, simple menus providing essential foods, and practical suggestions, both medical and culinary. Various physicians have contributed to this section. Part 3, Pediatrics, is contributed by N. T. Saxl in sections on infant feeding and the dietetic management of diseases of children. An appendix contains practical recipes by R. L. Gallup, together with dietetic notes, supplementary methods of feeding, and various tables for diet calculations.

Food and health: The physiological minimum (*Lancet [London], 1933, I, No. 11, pp. 597-600*).—This summary of information on dietary requirements, habits, and cost, as presented in recent English publications, has been prepared as a partial answer to the disputed question of the adequacy for the maintenance of health of existing unemployment allowances in Great Britain. The topics discussed include dietary requirements, as summarized by the Ministry of Health's Advisory Committee on Nutrition (E.S.R., 68, p. 125), the minimal cost of subsistence diets according to various estimates corrected to February 1933, the feeding of children as summarized in another report of the same committee on nutrition (E.S.R., 68, p. 276), and the problem of high rents and insufficiency of food.

A study of the milk consumption in 1,000 families in County Durham, C. M. BURNS (*Jour. State Med., 41 (1933), No. 7, pp. 414-432*).—Part 1 of this report gives the results of a survey of the total milk consumption of 1,000 families in Durham County, England, receiving milk assistance at welfare centers. The information obtained included total income of the families for the preceding week, rent, number in the family over and under 12 yr. of age, total milk purchased as fresh, dried, condensed, whole, or skimmed, and total milk assistance, fresh or dried.

After deductions for rent, fuel, and clothing, the average income per person per week ranged from 5s. 10d. for families of 2 members to about 3s. for families of 8 or over, these averages holding for between 70 and 80 percent of the families in these two groups.

From 30 to 45 percent of the families in each of the groups increasing in number by 1 from 2 in the family to 12 purchased no fresh milk, and from 2 to 8 percent only 0.5 pt. per week for the customary Sunday pudding. Not more than 20 percent of each group except the first (2 in the family) purchased more than 0.5 pt. per day per family in addition to the extra pint or half pint for the weekly pudding. Excluding the groups composed of less than 5 in the family, only from 10 to 12.5 percent of the families purchased 1 pt. of milk per day.

The total milk assistance amounted to from 0.8 to 3 pt. per person per week and included packets of dried milk distributed at the welfare centers and fresh milk given to individual children in the schools. Children from a total of only 103 out of the 1,000 families received this assistance. The amount of milk consumed from all sources rarely approached 0.5 pt. per person per day.

In part 2 the author discusses the work of various investigators, including Sherman and his associates, Orr, and Mann, pointing to the desirability of a liberal allowance of milk in the diet, particularly of growing children, and shows the impossibility of providing such liberal amounts as are recommended on the income available in families of the present study. The conclusion is drawn that "while sympathetic consideration of the difficulties of many households may help many people of the range of income here investigated to expend their limited incomes to better advantage, mere education in modern dietetic theories cannot bring about drastic changes in the dietary habits of these families until the cost of the milk and fresh vegetables relative to their values as staple foods more closely approximates to that of the cereals and dried vegetables at present used."

Bibliography of studies of family living in Asia, Australia, New Zealand, Peru, Mexico, and the islands of the Pacific: Preliminary report, C. C. ZIMMERMAN (*U.S. Dept. Agr., Bur. Home Econ., 1934, pp.* [2]+*58*).—This annotated bibliography presents in preliminary form part of the material prepared by the author for a publication which will include an analysis of methods and materials in studies of family living in the United States and other countries. The material in the present publication is arranged by countries as follows: Asia, including Arabia, China, Netherland East Indies, French Indochina, India, Japan, Chosen (Korea), Siam, and Syria; Australia; New Zealand; Peru; Mexico; and the islands of the Pacific, including Hawaii, Philippine Islands, and South Pacific Islands.

A basis of rationing for Federal prisoners, P. E. HOWE and A. H. MACCORMICK (*Amer. Jour. Pub. Health, 22* (*1932*), *No. 4, pp. 375–380*).—This paper describes a ration which has been set up for Federal penal institutions as an outcome of the previously noted study of the diets in five of these institutions (E.S.R., 67, p. 474). The ration is based on the kinds and amounts of foods consumed in these institutions, classified and grouped according to nutritive value and relative importance or palatability and modified to insure a balanced diet that will be reasonably satisfactory with regard to palatability. For the purpose of comparing the cost at various institutions, the value of the ration is estimated by applying the cost of foods typical of each group to the allotted weight of a food. The sum of the various groups represents the average cost per man per day within the limits of ± 10 percent.

The food types for the price basis of the various food groups are beef for meats and fish, oleomargarine for fats, white flour for flours, starches, and cereals, milk for dairy products, eggs at 1½ lb. per dozen for eggs, granulated sugar for sugars and sirups, coffee for beverages, cabbage for leafy, green, and yellow vegetables and tomatoes, potatoes for roots and tubers, navy beans for dried beans and peas, apples for fresh or canned fruits, prunes for dried fruits, salt for spices, and yeast for miscellaneous food adjuncts.

Some problems of feeding Federal prisoners, P. E. HOWE (*Jour. Amer. Dietet. Assoc., 8* (*1933*), *No. 6, pp. 517–525*).—This further description of the procedure adopted in the feeding of Federal prisoners, as noted above, is prefaced by a discussion of some of the problems common to successful feeding in any type of institution. The satisfactory and efficient feeding of large groups is considered to depend upon the wholesomeness and nutritional adequacy of the diet for the amount and kind of work performed by the individual, the cost of the adequate diet provided rather than the per capita cost, the palatability of the diet as attained through the skillful preparation of the food rather than the excessive use of foods appetizing in themselves, and the uniformity in quality and quantity of the food over long periods. In institutions where the food is paid for by the inmates and a satisfactory standard of quality and cooking has been established, it is considered better to lower and raise the charges for meals with changes in food prices than to shift to higher or lower satisfaction levels at the same price.

In explanation of the type food method of estimating the money allowances for food in Federal prisons, tabulated data are presented on the food groups, type food for price basis, and amount per man per day; the average consumption per man per day of various food groups in 1930, 1931, and 1932 at five Federal prisons; the food consumption in pounds per man per day of the patients in two private hospitals; and the average of all prison hospitals for the year 1931–32, a group of medical R.O.T.C. students, and for purposes of comparison preliminary data from the Bureau of Home Economics, U.S.D.A., on quantities of the same food groups required for moderately active women and men in adequate diets of moderate cost.

"In using such data, one must remember that any other group of individuals might have an adequate diet with a somewhat different distribution among the various food groups; we have such cases in certain groups of prisoners in the South. On the other hand, most of the information collected shows that the distribution we have used is rather common."

The chemical composition of the human fetus, M. H. Givens and I. G. Macy (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 7–17, figs. 4*).—Analyses of 25 human fetuses, ranging from 9 to 40 cm in length and estimated to vary from 2 to 8 mo. of age, were analyzed for calcium and magnesium and the data, combined with other analyses reported in the literature to make a total of 96, were used in plotting semilogarithmic graphs which show the composition of the fetus in utero with relation to age and consequently the relative mineral needs as pregnancy progresses.

The data indicate that "insofar as the mother is concerned the greatest mineral drain on her tissues comes during the last 3 months of gestation, for the fetal demand itself is insignificant up to this time. From the data available, the average monthly increments of the fetus from the second to the tenth months, respectively, are 0.07, 0.48, 2.64, 6.47, 4.71, 12.12, 12.80, and 41.96 g of ash; 0.01, 0.11, 0.83, 1.71, 0.98, 3.16, 3.54, and 12.1 g of calcium. It is important that during the last months of pregnancy the mother should demand the best available medical supervision and should follow rigidly the dictum of sound nutritional principles, in order that her own body tissues may be preserved and at the same time give to her unborn child materials of sufficient quality and quantity to satisfy optimal growth requirements."

Arginine metabolism.—II, The relation of the arginine content of the diet to the creatine-creatinine production during growth, C. E. Meyer and W. C. Rose (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 461–471*).—The question of the production of creatine and creatinine from preformed arginine in the food, previously studied by Hyde and Rose (E.S.R., 62, p. 693) by feeding an excess of arginine to two human subjects, was approached in metabolism experiments on rats by curtailing the arginine intake below the normal level to determine whether or not a decreased supply would inhibit creatine-creatinine production.

"The results show that under the conditions employed, the formation of total creatinine is very much greater than may be accounted for by the arginine ingestion, even when the use of arginine in the synthesis of tissue proteins is omitted from consideration. Evidently the production of creatine and creatinine is not dependent upon the quantity of preformed arginine in the food."

The possibility of the conversion of fatty acids to glucose in the animal body, H. H. Mitchell (*Jour. Nutrition, 6 (1933), No. 5, pp. 473–491*).—This critical review of the literature on the subject closes as follows:

"The sum total of the evidence for the possibility of a conversion of fatty acids to sugar seems to be merely suggestive, certainly far from conclusive. On the other hand, there is no justification for a catagoric denial that the conversion is possible. The verdict of 'not proven' is the most logical one to return.

"In concluding this discussion it may not be presumptuous to suggest a new line of attack. The mammary gland is concerned with the continuous secretion of sugar, and possibly with its continuous manufacture. The milk formed by the gland is passed to the exterior, where it may be weighed and analyzed. If this secretion can be maintained on a high-fat diet in any species of mammal, without destruction of body protein and after depletion of body glycogen, at such a rate that the nonfat constituents of the diet could not support it, a high probabiliy could be established that dietary fat was the source of the lactose formed. Negative results would of course possess little significance, since fat may be a specific inhibitor of lactation."

A bibliography of 39 titles is appended.

Glycogen formation in the white rat after oral administration of propionic, butyric, valeric, and caproic acids, H. C. Eckstein (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 591–594*).—Following the same technic as in an earlier investigation by Cutron and Lewis (E.S.R., 62, p. 693), the author studied the absorption of propionic, butyric, valeric, and caproic acids by young male rats and the corresponding glycogen formation. An increase in liver glycogen took place after the administration of propionic but not the other acids, although there was no failure of absorption in any case.

The effect of protracted exercise, intestinal fermentation, and modification of diet on the attainment of abnormal respiratory quotients by rats on a fat-deficient intake, L. G. Wesson (*Jour. Biol. Chem., 100 (1933), No. 1, pp. 365–371*).—In continuation of the studies of Wesson and Burr (E.S.R., 66, p. 390), the effects of various factors on the respiratory quotient were investigated.

It was found that prolonged forced exercise did not increase the carbohydrate assimilatory respiratory quotients of rats on the fat-deficient diet, that the effect of intestinal fermentation on CO_2 formation was negligible, that rats on a fat-deficient diet containing extracted casein, yeast, and the unsaponifiable fraction of cod-liver oil showed the same abnormality, with nearly as great frequency but not to as great a degree as those fed dextrin and salts alone. This is thought to indicate that the abnormally high respiratory quotients are not due to a deficiency in the diet of protein, vitamin A, vitamin B (complex), or vitamin D. In nearly every case the rats which had shown abnormally high respiratory quotients on the restricted diet continued to show the same abnormality on succeeding days under similar conditions.

A dietary factor concerned with carbohydrate metabolism, L. G. Wesson and F. C. Murrell (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 303–311, fig. 1*).—In this continuation of the investigation noted above, the liquid and solid fat fractions of lard and the saponifiable portion of the liquid fat fraction were tested for their ability to restore normal carbohydrate metabolism or prevent abnormalities in the metabolism in rats on a fat-free diet. Ethyl stearate was tested in like manner.

Both the liquid and solid fat fractions were effective, but the liquid fraction was 10 times as active as the solid fraction. The same quantity of ethyl stearate as of the liquid fat fraction of lard, which had proved effective, was inactive. When ethyl stearate was fed alone with the fat-deficient diet for a few days previous to the liquid fat feeding, the latter was not as rapidly effective. Both liquid and solid fractions in small quantities (6.67 mg daily) were effective in preventing the appearance of the metabolic abnormality, although they did not prevent to any extent stunting and emaciation. "This abnormal formation of fat from carbohydrate by the rat is not brought about because of a need of fat for catabolism, but because of a deficiency of some metabolic factor in food fat. The saponifiable fraction of the liquid fat or lard is active, thus indicating both the acid nature of the dietary factor and its resistance to saponification."

Variation of basal metabolic rate per unit surface area with age.—II, The pubertal acceleration, C. Bruen (*Jour. Nutrition, 6* (*1933*), *No. 4, pp. 383–395, figs. 8*).—The literature on the basal metabolic rate during the pubertal period is reviewed, and the data reported in some of the papers are analyzed according to the methods followed in the first paper of the series,[2] with the following conclusions:

"The basal metabolic rate during later childhood has been shown in numerous confirmatory investigations to give indications of a definite increase, or an irregularity in its decrease, related to puberty. The variation of the basal metabolic rate per unit surface area with age during the pubertal period may, therefore, be analyzed as the mathematical resultant of a fundamental decrease of the basal metabolic rate with age, and a superimposed cyclic acceleration. This cyclic acceleration of the basal metabolic rate is not a mere concomitant or effect of the adolescent growth cycle, but represents an independent pubertal metabolic acceleration."

The stimulating action of copper on erythropoiesis, H. B. Stein and R. C. Lewis (*Jour. Nutrition, 6* (*1933*), *No. 5, pp. 465–472, figs. 5*).—Essentially noted from a preliminary report (E.S.R., 68, p. 413).

Significance of copper and iron in blood restoration, C. A. Elvehjem (*Amer. Jour. Pub. Health, 23* (*1933*), *No. 12, pp. 1285–1289*).—In this paper, read before the food and nutrition section of the American Public Health Association at the 1933 meeting, the author discusses the practical significance of the findings in recent research in his own and other laboratories and in clinical observations relating to the part played by iron and copper in blood regeneration and maintenance, concluding as follows:

"We may say that diversified diets supply sufficient iron and copper for the maintenance of a normal blood stream in adults with normal hemoglobin requirements. For rapidly growing children and for adults with increased hemoglobin demands, many diets may be low in iron and possibly copper. The value of foods for supplementing diets low in iron and copper must be based upon the amount of available elements, not upon the total content. Diets deficient in blood-forming elements may be rendered complete by addition of standardized quantities of iron and copper salts."

The relation of iron and copper to the reticulocyte response in anemic rats, M. O. Schultze and C. A. Elvehjem (*Jour. Biol. Chem., 102* (*1933*), *No. 2, pp. 357–371, figs. 7*).—To determine the exact relation of iron and copper to reticulocyte response in anemic rats, iron was administered alone followed by copper alone, copper was administered alone followed by iron alone, and iron and copper were administered together to young rats in a condition of severe anemia (from 2 to 3 g of hemoglobin per 100 cc of blood), and daily determinations were made of hemoglobin, erythrocytes, and reticulocytes.

One mg of iron, together with 0.1 mg of copper per rat per day, brought about a very rapid increase in the number of reticulocytes to a maximum of from 1,500,000 to 1,700,000 per cubic millimeter in from 4 to 5 days, followed by an almost equally rapid decrease to values between 200,000 and 400,000. This was accompanied by a rapid and continued increase in both hemoglobin and erythrocytes, the former reaching values of approximately 8 g per 100 cc before the reticulocytes began to increase.

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[2] Jour. Gen. Physiol., 13 (1930), No. 6, pp. 607–616, figs. 6.

Iron alone in quantities of 0.5 mg daily had no appreciable effect upon reticulocytes, erythrocytes, and hemoglobin. On substituting 0.1 mg of copper for the iron after 29 days, there was a rapid increase followed by a decrease in the reticulocytes and a temporary increase in both hemoglobin and erythrocytes.

Copper administered alone in quantities of 0.1 mg daily brought about an immediate response in reticulocytes, which was maintained with daily fluctuations instead of dropping back to a lower level. When after a considerable time iron was substituted for the copper, the reticulocyte level returned to normal. On copper alone there was a slight initial rise in hemoglobin and erythrocytes.

On feeding various amounts and proportions of iron and copper, the minimum amounts required for typical reticulocyte response were estimated to be approximately 0.3 mg of iron and from 0.005 to 0.01 mg of copper per rat per day. A slight reticulocyte response was secured following the intraperitoneal injection of blood hemoglobin into anemic rats, but pernicious anemia liver fractions low in iron and copper failed to produce a typical reticulocyte response.

The authors conclude that copper is as essential a supplement to iron for the production of reticulocytes as for the regeneration of hemoglobin in rats depleted of their stores of copper and iron. "The results obtained with liver preparations indicate that the active material in liver cannot produce reticulosis in all forms of anemia. In pernicious anemia the response is due to an organic factor present in liver, but in secondary anemias the response is dependent upon the ingestion of sufficient iron and copper for hemoglobin formation. It is very probable that even in pernicious anemia the reticulocyte response following liver therapy depends in part upon the presence of sufficient available iron and copper."

The forms of magnesium in serum and milk, H. R. Benjamin, A. F. Hess, and J. Gross (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 383–390*).—This is a companion study for magnesium to the ones previously reported for calcium (E.S.R., 70, p. 418). The results obtained are summarized as follows:

"Magnesium, like calcium, was found to be adsorbable by $BaSO_4$ from normal sera and ultrafiltrates. By this technic magnesium was partitioned into the following three forms: A filtrable, adsorbable form, the remaining filtrable fraction containing magnesium ion, and a nonfiltrable form, possibly bound to protein. In hypercalcemia the level of adsorbable magnesium in the serum was found to be reduced to such an extent that it was frequently impossible to detect significant amounts.

"By means of artificial ultrafiltrates it was shown that the concentration of adsorbable magnesium varies directly with that of the phosphorus and inversely with that of the calcium. These relationships suggest that magnesium, like calcium, is probably adsorbed in combination with phosphorus. A similar partition of the magnesium in milk could not be accomplished. Although the degree of filtrability of the magnesium was approximately the same as in serum, the presence of an adsorbable form of magnesium in milk could not be demonstrated."

Studies of phosphorus of blood.—I, The partition of phosphorus in whole blood and serum, the serum calcium and plasma phosphatase from birth to maturity, G. Stearns and E. Warweg (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 749–765, figs. 4*).—Data are reported on the inorganic, lipoid, ester, and total phosphorus content of whole blood and serum, together with serum calcium and plasma phosphatase in a series of 150 determinations on the blood of 124 subjects, nearly half of whom were under 3 yr. of age. The studies on each age group were spread throughout the year to determine the possibility of seasonal variations. The individual determinations for each constituent are shown graphically, with smoothed curves for group averages.

No form of phosphorus was constant throughout the entire period of growth, each reaching a maximum value at some time during infancy or early childhood. The age at which the maximum value was reached and the length of time it was maintained varied for each component. For inorganic phosphorus of the serum, the maximum value was reached at from 4 to 6 mo. of age, for lipoid phosphorus at about 2 yr., and ester phosphorus and serum calcium at birth. The calcium level during infancy was higher than during childhood, and the values for the third year tended to remain constant throughout childhood and early adult life. The plasma phosphatase was low at birth, but rose abruptly to a maximum during the first month and remained fairly high until during the second year.

The percentage of corpuscles in the blood was high in the new-born, dropped rapidly during the first month, and then rose slowly during infancy and still more slowly during childhood, never reaching as high values in the adult as at birth.

Problems of vitamin terminology [trans. title], J. Kühnau (*Ztschr. Vitaminforsch., 1 (1932), No. 3, pp. 184–191*).—This discussion of the confusion in vitamin nomenclature contains a table of all the known vitamins, giving their descriptive names and letters, with the various names which have been assigned to them in the literature and a list of 20 references from 1930 to 1932.

The role of vitamins in the treatment of cervical hypersensitiveness, C. J. K. Ryan (*Jour. Amer. Dental Assoc., 20 (1933), No. 9, pp. 1712–1714*).—Cod-liver oil, orange juice, and an abundance of milk are recommended as efficacious in the treatment of hypersensitive cervices of the teeth. Several case reports are summarized showing the beneficial effects of the treatment, which consisted of 0.5 oz. of cod-liver oil and 3 oz. of tomato juice three times a day, with from ¾ to 1½ qt. of milk daily.

"How do drugs act?" W. L. Brown (*Brit. Med. Jour., No. 3804 (1933), pp. 1007–1010*).—This lecture discusses "some of the general principles underlying the action of drugs, the difficulties that are encountered in their study, and the problems that have still to be solved." Considerable attention is given to the action of hormones and of vitamins, particularly vitamins A and D, as exogenous hormones.

How do vitamins act? W. Cramer (*Brit. Med. Jour., No. 3806 (1933), pp. 1141, 1142*).—In this comment on the lecture by Brown noted above, the author calls attention to the fact that the analogy which was drawn between the action of hormones and vitamins agrees with his own views expressed nearly 10 yr. earlier (E.S.R.. 51, p. 667), that diseases resulting from a deficient supply of vitamins resemble endocrine dysfunctions. "Like the latter, they are the result of specific pathological changes in certain tissues, the changes varying in degree with the degree of deficiency in a particular vitamin or combination of vitamins and the length of time over which this deficiency is operative. These deviations from the normal can sometimes be restored by supplying the vitamin which has been lacking in the same way as the changes resulting from endocrine dysfunction can be restored by the requisite hormone. But with some of the vitamins, especially A and B, these primary pathological changes, if maintained long enough, lead automatically to the development of other pathological conditions which are thus an indirect effect of the vitamin deficiency and which, therefore, do not disappear when the vitamin is supplied. An understanding of this relationship is important in assessing the therapeutic possibilities of vitamins. It is even more important in showing that the failure of a vitamin to 'cure' a pathological condition does not necessarily prove that there is no etiological relation between that condition and the edficient vitamin supply. Such a simplification between cause and effect holds good for those pathological conditions which represent a primary effect, but not for those where a secondary pathological change has developed on the basis of the primary one."

With reference especially to vitamin A, it is emphasized that "vitamin A may be expected to restore the atrophic condition of the mucous membranes, but it cannot be expected to act upon the metastatic infections which originated from the infected mucous membranes. Under experimental conditions it does not even free the mucous membrane of the respiratory tract from its infected conditions."

The relation of vitamin A and vitamin D to urinary calculus formation, A. R. BLISS, JR., G. R. LIVERMORE, and E. O. PRATHER, JR. (*Jour. Urol., 30 (1933), No. 6, pp. 639–652*).—From the examination of various organs of large numbers of rats which had been maintained for 72 days or over on diets deficient in vitamin A, vitamin D, and both vitamins A and D, the authors have confirmed previous findings from many laboratories that insufficiency of vitamin A or carotene in the diet may be a factor in the formation of urinary calculi consisting chiefly of calcium and magnesium phosphates.

Of a group of 55 rats which had been fed a diet devoid of both vitamins A and D, 34 developed urinary calculi, while of a group of 56 fed a diet devoid of vitamin A alone, 32 developed calculi. There were no evidences of urinary calculi on the diets fortified with cod-liver oil and carotene, respectively. The slightly higher incidence of calculi in the rats on the diet deficient in both vitamins A and D than in A alone is thought to suggest the possibility that vitamin D may act indirectly in the prevention of calculi. The failure of all of the animals on the deficient diets to develop calculi suggests that some other influence than vitamin deficiency must be involved in stone formation. Stasis resulting from extensive inflammatory reactions, an imbalance in phosphorus metabolism, and infection are suggested as factors involved.

"Clinically one can utilize the results of these experiments by feeding patients who have passed [calculi] or from whom calculi have been removed foods rich in vitamins A and D, for it has been shown that a deficiency of these vitamins causes some metabolic upsets or produces back pressure and stasis that result in stone formation."

Vitamin studies (*Arizona Sta. Rpt. 1933, pp. 62, 63*).—Included in this progress report are data on the relative vitamin B and G content of grapefruit pulp and peel and the leaf and flower of broccoli.

A chemical and nutritive study of pecan oil, V. G. HELLER and H. S. HESTON (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *12 (1932), pp. 38–42*).—In this contribution from the Oklahoma A. and M. College, data are reported on the physical constants of cold-pressed oil from different varieties of pecans, including fresh native seedlings, rancid native seedlings, Halburt, Moneymaker, and Stuart, on the proximate composition of whole meats from the same varieties, and on the vitamin D content of new pecan oil and A content of new and rancid oil.

No appreciable amount of vitamin D could be detected in the oil. Both new and rancid oils contained some vitamin A, although 2 cc per rat per day proved insufficient for normal growth. In animals fed pecan meats as the source of vitamin A in quantities of from 0.5 to 1.5 g per rat per day, xerophthalmia was prevented and cured, but growth ceased in about 2 weeks.

Epithelial repair in recovery from vitamin A deficiency, S. B. WOLBACH and P. R. HOWE (*Jour. Expt. Med., 57 (1933), No. 3, pp. 511–526, pls. 3*).—This paper supplements earlier reports on the changes in the epithelial structures in vitamin A deficiencies in rats (E.S.R., 54, p. 891) and guinea pigs (E.S.R., 60, p. 393) by describing the sequence of repair from such deficiencies in 35 white rats following the administration of butterfat (or in a few instances cod-liver oil) as a source of vitamin A for from 3 to 43 days after periods of from 53 to 248 days on the deficient diet. The observations, while covering all organs, were especially concerned with the salivary glands, trachea, and uterus.

No reparative changes in the epithelial tissues, bones, or teeth were seen in any animal before a substantial gain in weight had occurred. The shortest period was 6 days and several of the rats did not show appreciable gains in weight for as long a period as 14 days. The presence or absence of infection was considered to be the most important factor in influencing recovery from vitamin A deficiency. In this connection the authors emphasize the fact that "the metaplasia of A deficiency in rats, guinea pigs, and human beings does not excite an infiltrative reaction, no matter how long the deficiency has continued, unless secondary infection has occurred. Bacteria and leucocytes may be present in great numbers in the superficial and desquamated keratinized cells without the deeper layers of the epithelium or supporting tissues becoming infiltrated by any type of wandering cell."

The histology of the repair of the epithelial cells is discussed in detail under three headings—repair following incomplete metaplasia, repair following complete metaplasia, and repair of epitheliums normally stratified. The phenomena of recovery were found to be common to all locations. All cells which have progressed to a certain degree toward keratinization either degenerate in situ and disappear or are cast off and disappear. The intermediate cells may vacuolize, separate, and disappear as do the keratinized cells, leaving the lowest stratum of viable cells which develop into the normal type.

The influence of the length of the test period on the accuracy obtainable in a vitamin A test, K. H. Coward (*Biochem. Jour., 27 (1933), No. 2, pp. 445–450, figs. 2*).—In view of the greater degree of accuracy claimed by Sherman and Batchelder (E.S.R., 66, p. 391) than by the author (E.S.R., 68, p. 565) in their respective technics for the determination of vitamin A, data obtained in the author's laboratory have been subjected to statistical analysis to see whether or not the longer experimental period in the Sherman technic (8 weeks as compared with 5) is responsible for a greater degree of accuracy.

"From the examination of our own experiments, it is evident that this is true only to the following extent: The degree of accuracy is much greater in a 2 weeks' test than in a 1 week's test. It is also greater in a 3 weeks' test than in a 2 weeks' test. As the test period is prolonged beyond 3 weeks, the accuracy still increases, but so very slowly that it is clearly evident that it is not worth while to carry on a vitamin A test longer than 3 weeks."

Vitamin A concentration of cod liver oil correlated with age of cod, N. L. MacPherson (*Nature [London], 132 (1933), No. 3322, pp. 26, 27*).—Studies at the biological laboratory of the Newfoundland Fisheries Research Commission on the cause of variations in the vitamin content of cod-liver oils have led to the conclusion that the relative value of the oils from different sources depends upon the growth rates and ages of the cod at these sources, the older the cod the higher being its concentration of vitamin A. The higher content of vitamin A in samples from the west coast than from the east coast of Newfoundland is attributed to the preponderance of older fish on the west coast. Increasing concentration with age is thought to represent an accumulation due to effective daily retention by the livers of small amounts of both carotene and vitamin A ingested.

The relation between vitamin-A metabolism and susceptibility to diphtheria toxin, C. C. TORRANCE (*Amer. Jour. Hyg., 18 (1933), No. 2, pp. 375–392, pls. 4, figs. 2*).—Guinea pigs on diets rich in vitamin A showed no increase in survival period after the injection of diphtheria toxin and their livers no increase in vitamin A storage. A higher degree of correlation was found to exist between the survival time and the amount of vitamin A stored in the liver than between this amount and the vitamin A taken into the body. "It would appear then that the infections which were found in these animals did not shorten their lives more than did the diminished amount of vitamin which seems to allow the infection to develop. One may ask whether such disease places an increased demand on the animal's reserve of vitamin, thus causing the infected animals to use their vitamin stores faster and become relatively more depleted."

The incidence of xerophthalmia and night-blindness in the United States—a gauge of vitamin A deficiency, A. F. HESS and D. B. KIRBY (*Amer. Jour. Pub. Health, 23 (1933), No. 9, pp. 935–938*).—An analysis of the 41 returns to a questionnaire sent out to 50 leading ophthalmologists in this country in regard to the incidence of xerophthalmia and night blindness in their practice showed that it is the consensus of opinion among these specialists that xerophthalmia is of rare occurrence in this country, that night blindness is even more exceptional, and that neither of these diseases has increased in frequency during the economic depression.

Vitamin A in the retina, G. WALD (*Nature [London], 132 (1933), No. 3330, pp. 316, 317*).—The announcement is made that vitamin A has been found "in considerable concentrations in solutions of the visual purple, in intact retinas, and in the pigment-choroid layers of frogs, sheep, pigs, and cattle. The nonsaponifiable extracts of these eye tissues display in detail all of the characteristics of vitamin A-containing oils." The evidence consisted of antimony trichloride color tests, as observed spectroscopically, of retinal and choroid layer extracts; measurements of the absorption spectra of chloroform solutions of oils from the retinas and pigment layers of sheep and oxen and from pig retinas; and feeding experiments on rats, using an extract of ox retinas from which the stearins had been frozen. In curative tests the minimum dosage was established at between 0.3 and 1 mg daily.

A method for the quantitative determination of vitamin A and its expression in international units [trans. title], A. SCHEUNERT and M. SCHIEBLICH (*Biochem. Ztschr., 263 (1933), No. 4–6, pp. 444–453, figs. 3*).—Various difficulties which the authors have met in attempting to use the Sherman method for determining vitamin A are discussed, and a curative method is described in detail in which the unit dosage is that quantity which barely suffices to cure xerophthalmia and keep alive for 35 days at least 8 out of 10 rats. As thus determined, the unit dosage of the international standard was 4γ.

The stability of the international standard carotene dissolved in oil [trans. title], A. SCHEUNERT and M. SCHIEBLICH (*Biochem. Ztschr., 263 (1933), No. 4–6, pp. 454–457, figs. 2*).—A 1 percent solution in sesame oil of the international standard carotene was kept in the cold and dark for 1½ years without loss in activity, as tested on rats by the method noted above.

The carotene content, vitamin A potency, and antioxidants of butter fat, C. I. SHREWSBURY and H. R. KRAYBILL (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 701–709*).—In this contribution from the Indiana Experiment Station, data are reported on the carotene content, as determined by colorimetric and spectrophotometric methods, of solutions of carotene in petroleum ether, of butterfat, and of butterfat to which varying amounts of carotene had been added. The colorimetric estimations were made in the authors' laboratory with a Leitz colorimeter at 40° C. and the spectrophotometric determinations by the method of Schertz in the Bureau of Standards, U.S. Department of Commerce.

The results obtained by the direct colorimetric method with butter alone and with added carotene were several times too high as checked by the spectrophotometric method, but those obtained with petroleum ether solutions of carotene alone dissolved in butterfat were fairly accurate.

Treatment of a petroleum ether solution of butterfat with adsorbent charcoal in amounts in excess of that actually required to remove all of the color of the butterfat destroyed the vitamin A activity as determined biologically.

Three samples of butterfat of decreasing carotene content were found to have decreasing vitamin A potency as determined biologically, thus showing that an appreciable proportion of the vitamin A activity of butter may be attributed to its carotene content.

Colorimetric determinations of the carotene content of butterfat decolorized with charcoal and then fortified with varying amounts of carotene showed rapid fading of the color. Under similar circumstances carotene added to untreated butterfat did not fade. The destruction of color was prevented by the addition of small quantities of hydroquinine. It is concluded that butterfat contains natural antioxidants which protect the carotene from oxidation and which are destroyed or removed by treatment of the butterfat with charcoal.

Influence of mineral oil on assimilation of vitamin A from spinach, H. S. Mitchell (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 2, pp. 231–233*).—In preliminary tests it was shown that the administration of 0.5 cc daily of mineral oil to rats with a unit dosage of dried spinach in vitamin A tests interfered seriously with the asimilation of this plant source of vitamin A, as had previously been found true by Rowntree (E.S.R., 65, p. 793) and Jackson (E.S.R., 66, p. 592) of animal sources of vitamin A. The paper reports an extension of the study to fresh spinach, 10 mg of which contained slightly more than 1 unit of vitamin A. When 0.5 cc of mineral oil, a quantity for rats estimated to be comparable to a moderate human dosage, was administered to rats together with graded amounts of spinach, from 100 to 120 mg of spinach was required to furnish a unit of vitamin A as compared with 10 mg when fed without the oil. When the oil was administered 6 hr. after the spinach, about 80 mg of the spinach was required for unit growth. When Paramels, a commercial product containing paraffin oils of high melting point, was fed with spinach to rats in doses of 0.65 g daily, equivalent to 0.5 cc of mineral oil, a dosage of 80 mg of spinach daily promoted growth at an average of 4.5 g weekly, or silghtly above unit rate.

The author concludes that the effect of mineral oil on vitamin A assimilation is of sufficient magnitude to be significant, and that the higher melting point paraffin oil and wax mixture is less detrimental.

On the formation of vitamin A from carotene in the animal organism, J. L. Rea and J. C. Drummond (*Ztschr. Vitaminforsch., 1 (1932), No. 3, pp. 177–183*).—"Incubation experiments in vitro with liver preparation from rats and cats have failed to demonstrate the presence of an agent capable of converting carotene into vitamin A. No explanation of this failure to confirm the observations of Olcott and McCann [E.S.R., 66, p. 607] has been found. Intravenous injection of colloidal suspensions of carotene into the liver circulation of cats was not followed by a detectable rise in the vitamin A content of that organ. In both series of experiments a large proportion of the carotene was converted into colorless or less colored substances. It is suggested that a carnivorous species such as the cat may not possess the ability to convert carotene into vitamin A, and that this power is normally part of the mechanism concerned with the assimilation of plant foodstuffs."

Vitamin B complex in meals from high-oil-bearing seeds, the peanut, cotton seed, soybean, and flax seed, F. W. SHERWOOD and J. O. HALVERSON (*North Carolina Sta. Rpt. 1932, p. 46*).—In this progress report information is given on the content of vitamins B and G in peanut meal made from different varieties of peanuts and of vitamin B in 36 percent cottonseed meal. The values are expressed in terms of dried brewers' yeast. Earlier work on the distribution of vitamin B in the peanut has been noted previously (E.S.R., 67, p. 778).

Vitamin B and liver glycogen [trans. title], H. G. K. WESTENBRINK (*Arch. Néerland. Physiol. Homme et Anim., 18 (1933), No. 3, pp. 429–445*).—The conflicting literature on glycogen formation in the absence of vitamin B is reviewed, and experiments are reported in which rats, after fasting for 24 hr., were given 2 cc of 50 percent glucose solution by stomach tube, and 24 hr. later were killed and decapitated and their livers analyzed for glycogen by the Pflüger method. This procedure was followed with rats on a complete diet and a vitamin B-free diet alone and supplemented with autoclaved yeast as a source of the thermostable factor and activated acid clay and crystalline vitamin B as sources of the heat-labile factor, respectively. No difference could be detected in the ability of the animals on the different diets to form glycogen.

Vitamin B and intestinal resorption [trans. title], H. G. K. WESTENBRINK and G. A. OVERBEEK (*Arch. Néerland. Physiol. Homme et Anim., 18 (1933), No. 3, pp. 416–428*).—A decreased rate of absorption of glucose from the intestinal walls was noted in rats suffering from a deficiency of the vitamin B complex, the heat-stable factor, and the heat-labile factor, respectively. Although the findings suggest the possibility of a specific effect on resorption of the B vitamins, it is thought more probable that the decreased absorption is the result of lowered food intake in B deficiency. It is considered to be an open question as to what function is primarily disturbed in cases of lowered resorption, the permeability of the intestinal wall, or the mobility of the stomach.

Vitamin C in blood and urine? M. VAN EEKELEN, A. EMMERIE, B. JOSEPHY, and L. K. WOLFF (*Nature [London], 132 (1933), No. 3330, pp. 315, 316*).—Evidence is summarized suggesting the presence of ascorbic acid in the reversible oxidized state in blood (man, rabbit, pig, guinea pig) and in the reduced state in urine and in cerebrospinal fluid.

In blood the trichloroacetic acid filtrate showed little or no reduction in the dichlorophenolindophenol test until after treatment with hydrogen sulfide in slightly acid solution for 6 hours and removal of the hydrogen sulfide by nitrogen. The average values for the reducing substance in 16 observations on human blood were 0.5 mg per 100 cc before and 2.05 mg after reduction. The blood of subjects eating much fruit and vegetables gave higher values than of those using more cereals. The blood of guinea pigs on the scurvy-producing diet had a gradually decreasing content of the reducing substance. When ascorbic acid was added to blood in vitro it quickly passed into the reversible oxidized form. The intravenous injection of decitrated lemon juice in rabbits caused an increase in the oxidized state of the substance. The substance was rapidly destroyed in alkaline solution and precipitated by lead acetate in neutral or slightly alkaline solution. On treating the precipitate with acid, the reducing substance was again obtained.

The tests for urine were similar to those for blood. More of the reducing substance was found in the urine of subjects consuming much fruit or decitrated lemon juice. In rabbits intravenous injection of decitrated lemon juice resulted in production of the oxidized form of the substance in the urine. The reducing substance gradually disappeared from the urine of guinea pigs on a scurvy-producing diet.

Spectrographic analysis of cerebrospinal fluid showed a maximum absorption at 2,650 A as does ascorbic acid.

Vitamin C in the adrenal gland of the human foetus and the physical state of the vitamin in the gland cell, G. Bourne (*Nature* [*London*], *132* (*1933*), *No. 3344, pp. 859, 860, fig. 1*).—Using a modification of the method described previously (E.S.R., 69, p. 903), the author has demonstrated the presence of vitamin C in the adrenal glands of a 55 cm human fetus. Attention is again called to variations in the granular form of the vitamin as thus demonstrated. These variations are thought to indicate that "the physical condition of the vitamin varies over a period of time, dependent upon factors as yet unknown, certainly modified by the physiological state of the adrenal cells, and undoubtedly modified to a certain extent by the reagents used upon the gland."

Vitamin C and the adrenals [trans. title], P. E. Galvao and D. M. Cardoso (*Compt. Rend. Soc. Biol.* [*Paris*], *115* (*1934*), *No. 3, pp. 350–352, fig. 1*).—Data are reported on the antiscorbutic activity of the adrenal glands of normal guinea pigs and the lack of vitamin C in the adrenals of scorbutic guinea pigs. The minimum protective dose for guinea pigs was established as from 0.6 to 1 g daily. Positive results were obtained in the silver nitrate reducing test with the adrenals of normal but not of scorbutic guinea pigs.

It is noted that these findings confirm those of Siehrs and Miller (E.S.R., 69, p. 619) and Harris and Ray (E.S.R., 70, p. 426), arrived at independently.

A review of methods used for diagnosis of scurvy in experimental guinea pigs, E. M. Pierson (*South Dakota Sta. Rpt. 1933, p. 23*).—This progress report compares the results, using canned spinach as test vegetable, of the Sherman, Tozer, and Höjer methods for determining the vitamin C content of foods.

Controlled formation of collagen and reticulum: A study of the source of intercellular substance in recovery from experimental scorbutus, S. B. Wolbach (*Amer. Jour. Path.*, *9* (*1933*), *Sup., pp. 689–700, pls. 2*).—Attention is called to previous studies (E.S.R., 54, p. 294) showing that in complete scurvy in guinea pigs formation of intercellular materials cannot take place, and that following the administration of antiscorbutics easily demonstrable amounts of intercellular substances are formed within 24 hr. This paper reports observations throwing light upon the sequences in the morphology of intercellular substances in the processes of repair, particularly as shown by the repair (following the addition of orange juice) of blood clot formed in scorbutic guinea pigs by removing pieces of the extensor thigh muscles under aseptic precautions.

The repair of the blood clot is described as beginning promptly by the migration of fibroblasts from adjacent tissues into the clot. These fibroblasts are vacuolated and the contents of the vacuoles are discharged, accumulating between the cells as the extracellular liquid considered to be responsible for the formation of collagen, the first product of repair. This is at first a homogeneous material in which argyrophile or reticulum fibrils promptly appear. The distribution and direction of collagen fibrils in recovery from scurvy are also influenced by fibroglia fibrils. It is of significance in connection with present knowledge concerning the chemical nature of ascorbic acid that, "in addition to possible mechanical functions, fibroglia fibrils are conductors of agents presumably having reversible enzyme activities."

A similar sequence takes place in the resumption of bone formation in recovery from scurvy. Attention is called to the similarity between the resumption of bone growth in recovery from rickets, scurvy, and vitamin A deficiency. "In each instance the reparative processes were identical with the normal sequences that the deficiency had suspended, but they proceeded in their early stages at a rate far beyond that of normal growth. This is probably true of recovery phenomena from all vitamin deficiencies and seems definitely so in the resumption of collagen formation by fibroblasts in the present study."

The relation of vitamin C deficiency to intestinal tuberculosis in the guinea pig, M. McConkey and D. T. Smith (*Jour. Expt. Med., 58 (1933), No. 4, pp. 503–512, pls. 3*).—This investigation was undertaken in an attempt to explain the improvement noted in the intestinal condition of patients with intestinal tuberculosis following the addition of cod-liver oil and tomato juice to the regular hospital diet. In the various experiments a total of 72 adult guinea pigs was fed tuberculous sputum daily for periods ranging from 6 weeks to 4 months. Of these 37 were kept on a diet partially deficient in vitamin C or vitamins A, C, and D, and 35 on the same diet supplemented with either tomato juice, cod-liver oil and tomato juice, or cabbage leaves. In the first group 26 and in the second only 2 developed ulcerative intestinal tuberculosis.

It is concluded that an adequate supply of vitamin C in the diet protects the guinea pig against ulcerative intestinal tuberculosis, and it is suggested that this also may be true for man. In regard to the clinical value of cod-liver oil, as well as tomato juice, in the dietary treatment of intestinal tuberculosis, it is pointed out that the guinea pig is less susceptible than man to vitamin A and D deficiency and that it is thus possible that a deficiency in the vitamins of cod-liver oil may play a part in the development of intestinal tuberculosis in man.

A reducing substance in tumours, L. J. Harris (*Nature [London], 132 (1933), No. 3337, p. 605*).—In extension of the study noted previously (E.S.R., 70, p. 579) it has been found that some two thirds of the reducing capacity of tumors in the dichlorophenolindophenol test is due to a constituent other than vitamin C. This has been shown to be unlike any known reducing substance. "It follows that the actively growing cell structure of the tumor tissue contains notably high concentrations of a hitherto unrecognized and unusually powerful reducing substance, for which, for ease of reference, the name 'reducytin' may be employed."

Certain effects of ultra-violet irradiation on the chemical and nutritive properties of baked products, J. W. Read and C. H. Bailey (*Cereal Chem., 10 (1933), No. 2, pp. 99–128, figs. 8*).—This contribution from the Minnesota Experiment Station reports studies dealing with the time required to induce an approved vitamin D potency in accordance with the standard technic established by Steenbock in the "premium" type of soda crackers, and the effects of irradiation on the keeping qualities of the crackers and the two types of shortening (lard and hydrogenated vegetable oil) generally used in their manufacture. In the preliminary work the line test method and in the later studies the bone ash method was followed. The data were confirmed in some instances by examination of the bones by photographic and radiographic methods.

The technic adopted for the irradiation of soda crackers on a commercial scale consisted in an exposure for approximately 10 sec. to an intensity of ultraviolet radiation equivalent to 94 e per second per mm^2. Longer periods of irradiation did not increase the antirachitic potency. Crackers made with irradiated shortening had antirachitic potency, but, as shown by rancidity tests of both the irradiated shortening and the irradiated crackers, the development of rancidity was hastened by irradiation. There was little difference between the lard and hydrogenated shortening in this respect.

These findings are thought to indicate that the direct irradiation of foods rich in shortening may induce problems from the standpoint of the keeping quality and marketability of the product.

The degree of accuracy obtainable by the line test in estimations of vitamin D, K. H. Coward and K. M. Key (*Biochem. Jour.*, *27* (*1933*), *No. 2*, *pp. 451–465*, *figs. 2*).—Attention is called to wide differences in the probable errors reported by various investigators for vitamin D determinations, and estimations are reported on the degree of accuracy obtainable by the line test as carried out in the authors' laboratories and described previously by Key and Morgan (E.S.R., 68, p. 279).

The conclusion is drawn that "the line test as carried out in our laboratories appears to have a probable error of 12 percent when the doses of vitamin D given range from 0.2 to 1.5 units. A somewhat greater degree of accuracy is obtainable by pairing rats as nearly as possible of equal initial weights."

The degree of healing produced by a given dose of vitamin D appeared to be influenced by the initial weight of the rat but not by the sex. Consequently, in paired tests the animals should be selected according to weight. Variations in weight increases during the 5 weeks of the test, including the preparatory period, were found not to influence the degree of healing produced by a given dose of vitamin D. Loss of weight during either of these periods produced spontaneous healing only when it exceeded 5 g. Variations in the sensitivity of an entire stock of rats put on experiment during different months appeared to follow partly, but not wholly, changes in the average initial weights of the animals from month to month.

The chief sources of error in the test are summarized as "(1) the inherent variability in response of different animals to the same treatment, (2) errors in judgment of estimation of healing, and (3) errors of technic in the giving of the daily doses of substance containing the vitamin."

Investigations on the determination of vitamin D by the preventive method.—The preventive dose established as curative, P. Schultzer (*Biochem. Jour.*, *27* (*1933*), *No. 2*, *pp. 376–381*, *figs. 4*).—In a further study of the preventive method of determining vitamin D, described previously (E.S.R., 67, p. 636), in which the degree of rickets in rats is determined by X-ray examination of the long bones at the end of 28 days, the examination was made at 4-day intervals in the hope of shortening the experimental period.

With varying doses of vitamin D in the form of cod-liver oil or irradiated ergosterol, it was found that on the lowest preventive dose (as determined by protection at the end of the 28-day period) signs of rickets (as determined by the widening of the epiphyseal zone) were evident on about the eighth day of the experiment. With increasing quantities of vitamin D, the zone at this time became narrower until on the previously determined curative dosage there was no increase in the zone during the course of the feeding.

"From this it is evident that the preventive method is related to the curative more closely than is generally assumed. The real preventive dose with cod-liver oil is in these experiments equal to the curative dose found by the author in previous experiments. In all the experiments described the breeding stock had been kept on Gudjónsson's diet No. 4, which is rather poor in vitamin D."

A note on the mode of action and administration of vitamin D, C. Daly (*Soc. Expt. Biol. and Med. Proc.*, *31* (*1933*), *No. 3*, *pp. 368*, *369*).—Observations on rats are reported briefly showing that an increase in the acidity of the gastric juice of rachitic rats induced by histamine did not bring about any healing of the rickets, and that subcutaneous administration of vitamin D is more effective than oral administration for large doses.

The role played by bile in the absorption of vitamin D in the rat, J. D. Greaves and C. L. A. Schmidt (*Jour. Biol. Chem., 102* (*1933*), *No. 1, pp. 101–112*).—The method followed in this study differed from that of a previous study dealing with the relation of bile to the absorption of vitamin A (E.S.R., 64, p. 588) in that the bile was withheld from the intestinal tract not by ligation but by connecting the bile duct to the lower colon. The technic for this is described. Calcium and phosphorus balances were used as the criteria for absorption of vitamin D, which was administered as irradiated ergosterol.

"It is recognized that in experiments of the type recorded in this paper not only considerable errors in the estimation of small amounts of calcium and phosphorus enter, but individual variations in the response of different animals to the same dose of viosterol, as well as possible differences in the flow of bile, must be considered. The conclusions are based on general trends rather than on precise quantities. It appears, however, that the data which were obtained in these experiments point to the fact that the bile acts as a carrier of vitamin D across the intestinal wall of the rat, and that in the absence of bile from the small intestines, as in the case of the bile fistula rat, little or no vitamin D is absorbed. Absence of bile from the intestinal tract is followed by loss of calcium and of phosphorus."

Studies on the distribution of irradiated ergosterol (vitamin D) in the animal organism after administration by mouth [trans. title], P. A. Coppens and G. A. Metz (*Arch. Néerland. Physiol. Homme et Anim., 18* (*1933*), *No. 3, pp. 407–415*).—Ten hr. after a dog had been given a definite quantity (0.1 mg per kilogram) of irradiated ergosterol by mouth it was killed, and other extracts were prepared from various organs. After purification from phosphatides, the organ extracts were tested for the presence of vitamin D by curative tests on rachitic rats, with X-ray examination of the bones.

The vitamin was detected in the liver, adrenals, lungs, spleen, blood, mesentery, and, in 2 out of 4 cases, in the kidneys. The vitamin could not be detected in extracts of the heart, brain, skin, and pancreas.

The effects of irradiated ergosterol on the metabolism of normal dogs, C. I. Reed, E. A. Thacker, L. M. Dillman, and J. W. Welch (*Jour. Nutrition, 6* (*1933*), *No. 4, pp. 355–370, figs. 8*).—Intravenous administration of large doses of irradiated ergosterol to normal dogs was found to produce a significant increase in the resting post-absorptive metabolic rate which could not be correlated quantitatively with any of the observed variable factors, including nitrogen, calcium, and phosphorus metabolism.

In one human subject, a man weighing 65 kg, a balance experiment was carried on with a foreperiod of 1 week, after which 15 injections of 0.5 cc of 10,000 X viosterol were given during 16 days. The blood calcium was increased significantly only on the eleventh day. There were no significant alterations in the nitrogen balance. There was definite phosphorus retention for 2 weeks and greater retention during the remaining 2 days of injections, followed by progressively increasing elimination during a 3-day afterperiod. Calcium elimination was well balanced during the foreperiod and the first 2 weeks of the experimental period. There was a definite increase in the urinary calcium fraction, both relative and absolute, with progressive retention. "The patient experienced no subjective symptoms at any time and maintained constant weight."

The calcification of tissues by excessive doses of irradiated ergosterol, C. I. Reed, L. M. Dillman, E. A. Thacker, and R. I. Klein (*Jour. Nutrition, 6* (*1933*), *No. 4, pp. 371–381*).—This paper reports analyses for calcium and phosphorus of 12 tissues from 13 normal dogs and from 14 dogs which had served as subjects in the study noted above.

"Statistical treatment of the data shows that the Ca content of any tissue may be significantly increased by viosterol administration, although wide variations may occur, certain tissues showing no increase. The magnitude of the increase in Ca content is not correlated with the viosterol dosage but seems to depend on some undetermined individual factor or factors. The P content, while widely variable among individual animals, was affected by viosterol administration in a much less constant manner, if at all."

The intraperitoneal administration of viosterol in mice, J. W. Spies and G. P. Lyman (*Amer. Jour. Physiol., 102 (1932), No. 3, pp. 527–533, figs. 4*).—This paper reports a simple, safe, and reliable method for the intraperitoneal administration of viosterol to mice, and data indicating that the method is suitable for laboratory animals when the utilization of an exact amount of viosterol is desirable and when the avoidance of diarrhea is advisable. Following the administration of large doses of viosterol in this way, calcium deposits were most marked in the lungs, stomach, kidney, and aorta.

Growth, reproduction, and lactation in the absence of the parathyroid glands, F. L. Kozelka, E. B. Hart, and G. Bohstedt (*Jour. Biol. Chem., 100 (1933), No. 3, pp. 715–729, fig. 1*).—Three series of experiments are reported showing that completely parathyroidectomized puppies, when fed suitable amounts of vitamin D, calcium and phosphorus salts, and thyroid gland are capable of growing normally and of surviving a complete reproductive cycle. This is thought to indicate that the parathyroid glands do not perform a specific function in metabolism necessary for life. It is suggested that the function of these glands in normal animals is to maintain a normal serum calcium and phosphorus level in the blood at the expense of the skeleton, especially toward the end of gestation and early lactation when the demands for calcium and phosphorus are particularly large. "Their unusual activity in late gestation and early lactation would account for the many negative calcium balances that have been observed in lactating animals in spite of the ingestion of liberal amounts of vitamin D."

The pregnant and lactating animals were fed massive doses of vitamin D (as high as 40,000 rat units daily for several weeks) without any ill effects unless the serum calcium rose above 14 mg per 100 cc of blood. "The fact that the symptoms of toxicity appear simultaneously with the rise in serum calcium and disappear when the calcium falls to a normal level seems to indicate that the toxicity is due to the metabolites of vitamin D rather than to vitamin D itself."

Experimental evidence of an additional substance essential to mammalian nutrition, L. N. Ellis (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 3, pp. 339, 340*).—Evidence is summarized showing that in rats on diets planned to be adequate in all known nutritional essentials except for varying quantities of vitamin G growth was inhibited by the higher concentrations of vitamin G and that this effect was carried over to the young, which weighed progressively less at weaning the higher the concentration of vitamin G in the diet of the mothers. When some of these young were placed on the Bourquin-Sherman vitamin G-deficient diet, those showing the poorest growth now grew the best. This is thought to indicate the presence of a nutritionally essential substance in the Bourquin-Sherman vitamin G-deficient diet, probably in the alcoholic extract of whole wheat. The substance appears to be identical with or closely related to Reader's vitamin B_4 (E.S.R., 64, p. 195) and to the factor reported by Halliday (E.S.R., 68, p. 279), and different from the Coward factor of milk (E.S.R., 63, p. 193). Its presence in the whole wheat extract demonstrates its extractability by ethyl alcohol, 80 percent by weight, and its relative stability to heating at 78° C. for 2 hr.

Studies in the nutritional anemia of the rat, VII, VIII (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 359–372*).—In this continuation of the series of studies noted previously (E.S.R., 67, p. 346), two papers are presented.

VII. *Influence of parenterally administered iron*, M. W. Eveleth, F. C. Bing, and V. C. Myers (pp. 359–368).—Essentially noted from a preliminary report (E.S.R., 69, p. 904).

VIII. *A method for the estimation of hemoglobin and erythrocytes on a single small sample of blood*, R. W. Heinle and F. C. Bing (pp. 369–372).—In the method described the estimation of both red blood cells and hemoglobin may be carried out on the 0.005 cc of blood withdrawn for the red cell count. The suspension remaining in the dilution pipette after the determination of the cell count is utilized for the estimation of hemoglobin by the benzidine method.

"The accuracy of the hemoglobin estimation depends largely upon the accuracy with which the blood can be measured. With care, duplicate determinations should agree within 2 or 3 percent."

The deficiency anaemias of childhood, L. G. Parsons (*Brit. Med. Jour., No. 3796 (1933), pp. 631–636*).—The deficiency anemias of childhood are classified as hypochromic, including nutritional or alimentary anemia of infants, hypochromic anemia of celiac disease, and anemias of scurvy and of cretinism; and hyperchromic, including the hyperchromic anemia of celiac disease and bothriocephalus anemia. The nutritional anemia of infants is considered in greatest detail, the term being used to cover those forms of deficiency anemias which are due to an inadequate supply of iron (or iron and copper). The author is of the opinion that, unlike experimental anemias in rats, this form of anemia can usually be cured by adequate doses of pure iron without the addition of copper, although it may occasionally be the result of defective supply of both iron and copper and thus require both of these metals for its cure.

Amount of material effective in pernicious anemia present in dog liver, M. B. Strauss and W. B. Castle (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 3, pp. 360–363*).—Extracts suitable for intramuscular injection were made from normal dog and hog livers and tested alternately by intramuscular injection on four pernicious anemia patients.

In the first subject tested the extract from 20 g of dog liver was without effect, but that from the same quantity of hog liver induced satisfactory response. On increasing the dog liver extract to that obtained from 100 g, the response in the other subjects was as rapid as with the smaller amount of hog liver extract.

It is concluded that dog liver contains the thermostable factor effective in pernicious anemia, but that the content of potent material is only one fifth that of hog liver. In explanation of this lower concentration, contradictory findings concerning the presence of the intrinsic factor in the gastric juice of the dog are cited, suggesting that the quantity of the intrinsic factor in the gastric juice of the dog is too low to produce appreciable amounts of the thermostable factor in the liver.

The pathology of the bone marrow in sprue anemia, C. P. Rhoads and W. B. Castle (*Amer. Jour. Path., 9 (1933), Sup., pp. 813–826, pls. 3*).—Observations on the bone marrow of sprue anemia obtained at biopsy in different stages of the disease show that the changes during relapse and remission are similar to those of pernicious anemia. It is stated that as a rule the effect of liver extract on the lingual and gastro-intestinal symptoms of sprue anemia is as striking as in pernicious anemia, although the hematopoietic response is frequently not as marked. In sprue a combination of iron with liver extract therapy is often necessary. "Despite this fact, the basic similarity of the blood pictures and of the changes in the active portions of the bone marrow in relapse and in response to similar therapy would seem to be strong evidence for a similar etiological mechanism."

Autolysed yeast products in the treatment of anaemia, L. S. P. Davidson (*Brit. Med. Jour., No. 3792* (*1933*), *pp. 481–487, fig. 1*).—The author reviews the conflicting literature on the value of vitamin B preparations in the treatment of various anemias and gives 16 case reports showing the therapeutic effect in pernicious anemia of autolyzed yeast products and of yeast and 12 from the practice of C. C. Ungley showing the effects of treatment with yeast (marmite) and wheat embryo (Bemax).

In the author's series of cases there were 7 failures to respond to marmite or extracts made from it, but rapid response to the anti-anemic factor in liver, liver extract, or hog stomach tissue; 4 failures to respond to marmite, with slow response to the anti-anemic factor; 2 failures to respond to either treatment; 1 moderate and 1 excellent response to marmite and 1 to a fraction of the marmite prepared similarly to liver extract.

These findings, together with somewhat better results reported by Ungley, have led the author to conclude that "the factor which decides whether a response to marmite therapy will occur, and if so in what degree, depends essentially on the ability of the stomach to secrete intrinsic factor. Sufficient evidence is not at our disposal to settle the difficult problem of the nature of the hemopoietic principle in marmite. It may eventually emerge that autolyzed yeast products contain not only a large amount of concentrated extrinsic factor, but also a small amount of the specific anti-anemic factor as well."

In discussing the nature of the active substance, evidence is cited, including a personal communication from Strauss and Castle, indicating that the hemopoietic factor in liver, liver extract, and yeast is not vitamin B_2. The possibility is suggested that it may be the same substance as the anti-anemic factor of liver extract, in which case it is produced by the action of yeast enzyme (intrinsic factor) on yeast protein (extrinsic factor) during autolysis, or that it may be merely concentrated extrinsic factor. If the first hypothesis is correct, failure to respond to treatment must be due to insufficient dosage on account of its low concentration; if the second, variation in the response to treatment must depend on the absence or presence of the intrinsic factor in the patient's stomach.

In regard to other effects produced by autolyzed yeast products and their practical therapeutic value, attention is called to the general beneficial effects of small doses (1 teaspoonful 3 times a day) and the irritating effects upon the gastro-intestinal tracts of large doses (2 to 4 teaspoonfuls twice a day). In the treatment of subacute combined degeneration of the cord and iron deficiency anemias yeast products are valueless.

Observations on diet and its relation to dental disease, J. Lennox (*Jour. Amer. Dental Assoc., 20* (*1933*), *No. 12, pp. 2203–2210*).—In this contribution from Cape Town, South Africa, the theory is presented and discussed that "our civilized diets are caries-producing because they are so denatured by civilized methods of preparation as to become deficient in phosphorus. Our bodies, therefore, became phosphorus-deficient, and in an effort to remedy this deficiency some change took place in the saliva which appeared to remove its natural inhibitory action on the activities of the lactobacilli, and thus by carbohydrate fermentation, lactic acid formation, phosphorus was leached from the crowns of teeth."

Specimen so-called purified and unpurified diets are given with their calcium and phosphorus content, showing much greater differences in phosphorus than in calcium. The theory is supported by references to the literature and by clinical observations of results following the administration of sodium glycerophosphate in doses of 7.5 grains daily to patients subject to dental caries.

Recent developments in the study of dental caries, R. W. BUNTING (*Science, 78 (1933), No. 2028, pp. 419–424*).—In addition to a discussion similar to that previously noted (E.S.R., 70, p. 571) of the *Bacillus acidophilus* theory concerning the cause of dental caries, attention is called to so-called constitutional factors in dental caries, including heredity, age, bodily health, and diet and nutrition. Admitting that dietary programs "appear to inhibit dental caries", the following comment is made:

"The manner in which diet exerts a controlling influence on the disease, whether it is through the determination of the character of the local food residues in the mouth or through the production of metabolic states which determine the activity of the aciduric organisms in the mouth, is not known. Nor, indeed, has it been determined precisely what types of diets are most beneficial in this regard."

The effect of the feeding of fluorides upon the chemical composition of the teeth and bones of albino rats, M. C. SMITH and E. M. LANTZ (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 677–683*).—In this complete report of an investigation noted previously from a preliminary report (E.S.R., 68, p. 710), data are presented on the composition of the incisor teeth and tibias of rats kept for periods of 60 and 120 days after weaning at 28 days on the Sherman diet B alone and with the addition of 0.05 and 0.1 percent of sodium fluoride.

The teeth and bones of the animals receiving the lower concentration of sodium fluoride showed no significant alterations from normal in the percentages of ash, calcium, and phosphorus. Both the teeth and bones of the animals receiving the higher concentration had a lower ash content, but contained a higher percentage of calcium and a lower percentage of phosphorus and consequently a higher Ca : P ratio.

The possible relation of these findings to the nature of the changes which affect the composition of the teeth and bones of fluoride-fed animals is discussed. "It is interesting to note that the percentages of calcium and the ratios of calcium to phosphorus in the teeth of the animals fed 0.1 percent sodium fluoride, as obtained by chemical analysis, are remarkably similar to the calculated ratio of the perhaps theoretical compound collophane, $3Ca_3(PO_4)_2.2CaF_2$."

[Mottled enamel investigations] (*Arizona Sta. Rpt. 1933, pp. 16, 58–62, fig. 1*).—Studies noted in this progress report include an extension of previous studies on the fluorine content of drinking water supplies in various parts of the State (E.S.R., 68, p. 413), additional work on the technic of determining fluorine, the effect of supplemental feeding of vitamin D on the development of mottled enamel, the effect of fluorine feeding on the metabolism of calcium and phosphorus in children, rats, and dogs, and the comparative toxic effects for rats of different compounds of fluorine such as are used in spray materials.

Diabetes, with special reference to high carbohydrate diets, R. D. LAWRENCE (*Brit. Med. Jour., No. 3793 (1933), pp. 517–521*).—In this lecture delivered at the 1933 meeting of the British Medical Association, the author discusses the theoretical and practical aspects of increased carbohydrate diets in the treatment of diabetes and describes a method which he has followed with success in the treatment of several hundreds of insulin cases. The method consists in supplying a regular amount of carbohydrate, usually between 100 and 150 g daily, balanced by its correct dose of insulin, but with no regard to protein, fat, or total calories. "The greatest advantage is the freedom of the patient and the minimum of preoccupation with the disease. Only the carbohydrates have to be measured or weighed and the adequate dose of insulin taken. As a rule attention need be paid only to the more concentrated carbohydrates like bread, cereals, potatoes, fruits, etc."

It is noted, however, that the moderate carbohydrate, free protein, and fat diet is not advocated for the obese or in general for children, who are often much better treated by total regulation of diet.

The diabetic diet in emergencies and complications, R. Pybus (*Med. and Prof. Woman's Jour., 40 (1933), No. 12, pp. 354–357*).—The emergencies and complications for which adjustments in diabetic diets are discussed include ketosis or acidosis, impending coma, febrile infection, diarrhea, peptic ulcer, gall bladder troubles, and surgery. Specimen fluid and light diets are given for use in fever, a low roughage diet for diarrhea, and a special diet for peptic ulcer.

Studies on the relation of diet to goiter, I, II, H. Levine, R. E. Remington, and H. von Kolnitz (*Jour. Nutrition, 6 (1933), No. 4, pp. 325–345, figs. 3; 347–354, fig. 1*).—Two papers are presented.

I. *A dietary technic for the study of goiter in the rat.*—The discovery by Krauss and Monroe (E.S.R., 65, p. 97) that the Steenbock-Black rickets-producing diet produces thyroid enlargement in rats was confirmed in preliminary experiments undertaken to develop a satisfactory goiter-producing diet for rats. In addition it was found that the thyroid enlargement thus produced can be reduced and the iodine content of the glands increased by the administration of from 4 to 5γ of iodine daily as KI, that goitrous glands have a dark red color in contrast to the pale pink color of normal glands and are low in iodine and solids, and that rats on a high iodine stock diet are capable of storing iodine to such an extent as to retard glandular enlargement when placed on a goiter-producing diet. The conclusion of Thompson (E.S.R., 68, p. 567) that goiter on this diet develops both in the presence and absence of rickets was confirmed, and it was shown further that increasing the supply of vitamin A in the diet is without effect and that anemia is not a concurrent manifestation of goiter. Based on these preliminary findings, the Steenbock diet modified by the addition to 100 g of the diet of 0.2 g of irradiated yeast with a vitamin D potency 15 times that of a standard cod-liver oil was adopted as the goiter-producing diet.

A total of 193 rats was fed this diet, 24 the diet plus sufficient potassium iodide to furnish 3.72γ of iodine per rat per day, and 39 the stock diet containing from 47 to 72γ of iodine per kilogram. The effects on the thyroid gland of the various diets are summarized as follows:

On the goiter-producing diet the thyroid glands show a dark red color and marked hyperplasia with little or no iodine-containing colloid, an average fresh weight of 53.2±0.92 mg per 100 g body weight representing an average enlargement of from 4.1 to 4.2 times the normal gland weight, a low dry matter content of 19 percent, a low concentration of iodine of 0.0083 percent dry basis, or 0.0016 percent fresh basis, and a low total iodine content per gland of 0.88γ. The glands of the rats receiving the goiter-producing diet plus added KI showed a normal pale pink color, normal histological structure with an abundance of colloid, an average fresh weight of 12±0.19 mg per 100 g body weight, a dry matter content of 28 percent, and an iodine concentration of 0.267 percent dry basis, or 0.0745 percent fresh basis, with a total iodine content per gland of 10.28γ. The thyroids of the rats on the stock ration gave comparable results to those on the basal ration with added iodine.

II. *The iodine requirement of the rat.*—Using as criterion the smallest amount of iodine necessary to prevent any significant thyroid enlargement, the minimum iodine requirement for rats was found to be approximately 1–2γ per rat per day, a quantity yielding a concentration of 0.11 to 0.18 percent iodine (dry basis) in the thyroid.

It is noted that the inclusion of 4 percent of the Osborne-Mendel salt mixture in synthetic diets for rats provides from 5 to 10 times this minimum iodine requirement. From the relative caloric needs of the rat and the human being, the minimum iodine requirement for the latter is calculated to be approximately 60–120γ per day.

Is goiter due to an iodine deficiency per se? H. LEVINE and R. E. REMINGTON (*Jour. Chem. Ed., 10 (1933), No. 11, pp. 649–659, figs. 6*).—In this literature review the authors summarize the various diseases associated with disturbances in the functioning of the thyroid gland, review briefly recent studies on the relation to these disturbances of other factors than iodine, including cabbage, calcium, light, temperature, season, endocrine glands, vitamins, infections, and chemical stimulation, and discuss their own experimental work on the production and study of goiter in the rat, noted above.

A list of 129 references to the literature is appended.

The importance of relative iodine deficiencies in certain forms of goiter, D. MARINE (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 1, pp. 1–5*).—Attention is called to the fact that while goiter is always dependent immediately upon a deficiency of iodine, the deficiency may be absolute or relative, or a combination of the two. The discussion is limited to one type of relative iodine deficiency illustrated by the thyroid enlargement which can be produced in rabbits by feeding cabbage as the principal food. The history of this discovery and studies which have been made to explain why cabbage sometimes does and again does not cause goiter in rabbits are summarized briefly. It is shown that cabbage contains a nitrile, as yet unidentified, which may cause thyroid hyperplasia indirectly by blocking oxidation processes in the body, but that hexuronic acid (vitamin C), also present in fresh cabbage and other plant materials, is probably capable of preventing this action. The difference between the action of iodine and hexuronic acid as antigoitrous factors is explained as follows:

Iodine "prevents goiter by supplying the essential constituent of normal thyroid secretion and makes it possible for the thyroid to produce all the hormone needed without enlarging. The second substance (hexuronic acid?) probably prevents thyroid enlargement by aiding the thyroid in promoting tissue oxidations, and in this way exercises a thyroid-sparing action indirectly, or directly by neutralizing substances having a cyanide-like action."

Iodine and goiter with special reference to the Far East, J. F. McCLENDON (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 91–99, figs. 2*).—Data are reported on the iodine content of 79 species of edible seaweed from about 14 localities on the coast of Japan, the only nongoitrous country found by the author in a study of goiter around the world.

The content of iodine was so high in all the species examined that the data are reported in milligrams per kilogram or parts per million instead of the usual micrograms per kilogram or parts per billion. The data are tabulated by class, family, genus, and species. A greater variation in iodine content was shown by species than by locality. The highest content was found in the Laminariaceae or kombu, one species of which contained 7,620 p.p.m.

Lathyrism in the rat, B. J. GEIGER, H. STEENBOCK, and H. T. PARSONS (*Jour. Nutrition, 6 (1933), No. 5, pp. 427–442, pls. 4*).—In this contribution from the Wisconsin Experiment Station evidence is presented that lathyrism can be produced in both young and adult rats by feeding diets containing *Lathyrus odoratus*, the flowering sweet pea, in concentrations of 25 percent.

The symptoms noted, in addition to retardation of growth, were "lameness, spinal curvature, sternal curvature, enlargement of the costochondral junctions, and malformation and abnormal red color of the long bones. Calcification was interfered with in young animals. The decided reddish color of the bones harmonized with a slight polycythemia and increased hemoglobin content of the blood. Hernias were also observed."

Mellanby's hypothesis (E.S.R., 63, p. 594) that vitamin A affords protection against lathyrism was partially confirmed in that adult rats were protected to some extent by the inclusion of 2 percent of cod-liver oil in the diet. Young animals received no protection from cod-liver oil, cod-liver oil concentrate, or dried yeast. Inasmuch as the sweet peas proved to be an unusually good source of vitamin A, the possibility is suggested that the vitamin A in the sweet peas exerted a substantial neutralizing effect without the addition of cod-liver oil. The advisability of testing this possibility by using water extracts of the peas is suggested. "However, we believe that even with our present technic we discovered some prophylactic action with cod-liver oil. The results seemed to be clean-cut with our adult animals."

Preliminary note concerning the appearance of experimental dermatitis (pellagra) in rats, M. Kellogg and W. H. Eddy (*Science, 78 (1933), No. 2035, p. 609*).—The possibility is suggested that the production of pellagra-like symptoms in rats, and possibly of pellagra in man, is due to low or subminimal amounts of vitamin B_2 (G) coupled with high or adequate B (B_1). Experiments are summarized in support of this hypothesis, and attention is called to the fact that corn and other whole cereals which constitute a large part of pellagra-producing diets are rich in vitamin B and low in vitamin G.

Current theories on the aetiology of pellagra, H. Chick (*Lancet [London], 1933, II, No. 7, pp. 341–346*).—In this De Lamar lecture, delivered at the School of Hygiene and Public Health, Johns Hopkins University, in November 1932, the author discusses certain weak points in the two main theories of the present time concerning the etiology of pellagra: (1) Its association with an amino acid deficiency in the diet and (2) its association with a vitamin deficiency, and formulates a new theory that "pellagra is caused by a toxic substance derived from the maize diet, which can be corrected by sufficient 'good' protein, or perhaps by sufficient vitamin B_2 (which is found to accompany the 'good' proteins)."

In presenting this theory the author admits that it is at present only a speculation, but that it may serve as a useful hypothesis to those studying the etiology of the disease and as a stimulus to research in certain directions "which may result in further progress toward the solution of the mystery which at present shrouds the cause of the disease."

A list of 47 references to the literature is appended.

Treatment of pellagra by means of parenteral liver extract, T. D. Spies (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 3, pp. 363, 364*).—Six patients with the classical skin and mouth lesions of pellagra were kept on a pellagra-producing diet until the stomatitis and glossitis became worse and were then given 80 cc of liver extract by intravenous injection in four doses during a 20-hour period. Four other patients under the same dietary treatment were given intramuscular injections of a suitable extract in three doses of 10 cc each.

In both cases the lesions in the tongues and oral mucous membranes showed improvement within 24 hr. after the first injection and were healed within 72 hours. "It is suggested that liver extract be used as a parenteral therapeutic agent whenever a severe pellagrin has difficulty in ingesting or assimilating adequate amounts of a highly nutritious diet."

The behavior of the epiphyseal cartilages in rachitic rats, G. S. Dodds and H. C. Cameron (*Anat. Rec., 55 (1933), No. 4, Sup., p. 14*).—In this contribution from the West Virginia Experiment Station a brief summary is given of changes taking place in the epiphyseal cartilages in the heads of the tibias of albino rats during the development of rickets on the Steenbock-Black high calcium, low phosphorus diet 2965.

Beryllium "rickets," B. L. Guyatt, H. D. Kay, and H. D. Branion (*Jour. Nutrition, 6 (1933), No. 4, pp. 313–324, pl. 1*).—A condition showing many of the characteristics, both histological and chemical, of experimental rickets has been produced in rats by replacing the calcium carbonate of the Steenbock rickets-producing diet 2965 with an equivalent amount of beryllium carbonate, or by adding small quantities of this substance to the Bills normal stock diet. The percentage of ash in the bones is greatly diminished, there is almost complete failure of mineral deposits in the metaphysis, and the amounts of mineral salts in the trabeculae and cortex of the tibia are reduced. The contents of inorganic phosphorus in the blood plasma, of acid-soluble phosphorus in the liver, and of phosphatase in the kidney are greatly reduced. These findings are thought to support the view that experimental rickets is primarily due to the deficient absorption of phosphate from the intestine. The bone lesions in beryllium rickets, unlike those of ordinary rickets, are not preventable by cod-liver oil, irradiated ergosterol, or ultraviolet light.

Contribution to the method of gas analysis for respiration trials, M. Kleiber (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 583–594, fig. 1*).—Factors which, in the experience of the author, have been found to effect the accuracy obtainable in modern gas analysis in a Haldane apparatus (Carpenter form) are discussed, and a modified apparatus and technic are described by which errors resulting from changes in partial pressure and distillation of water from the measuring pipette are said to be avoided.

Some considerations on precise analysis of air from respiration chambers, T. M. Carpenter (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 595–601*).—In reply to the above-noted paper, which was seen in manuscript, the author discusses the problems raised and presents data showing the accuracy of performance possible in the apparatus as used in the Nutrition Laboratory of the Carnegie Institution. In his opinion all attempts thus far to overcome the small errors that are theoretically possible in gas analysis have met with only partial success and have resulted in apparatus so complicated as to be impractical.

"In view of the various series of analyses of outdoor air and of the determinations of respiratory quotients of burning alcohol or acetone we shall continue to use this apparatus in this laboratory and cooperating laboratories until it is either modified or another is devised that is more accurate, speedier, and at the same time a practical apparatus, easily duplicated and transportable without danger of breakage. The routine now used has been subjected to so many trials and variations without appreciable improvement that we shall continue to use the same procedure until a better one is devised."

TEXTILES AND CLOTHING

[Wool research by the Wyoming Station] (*Wyoming Sta. Rpt. 1933, pp. 20, 21*).—Experiments reviewed briefly included shrinkage tests of wool by grades and of small samples, persistence of fineness of fleece on an imported merino ram, and comparisons of extract of yucca root with commercial deter-
grades and of small samples, persistence of fineness of fleece on an imported

The influence of various grades of wool on some of the physical properties of flannel, E. M. Pierson (*South Dakota Sta. Rpt. 1933, pp. 24, 25*).—Observations are recorded from textile studies on wool fibers from six breeds of sheep and on the yarns and fabrics made from these wools.

Cotton bags as consumer packages for farm products, R. J. Cheatham and J. T. Wigington (*U.S. Dept. Agr., Misc. Pub. 175 (1933), pp. II+10, figs.*

10).—The advantages, extent of use, sizes, and fabric specifications for cotton bags for retail packaging of different farm products are reviewed, with a brief description of the duplex open-mesh and close-mesh cotton fabrics developed in cooperation with the Textile School of the North Carolina State College. A survey in markets and producing sections showed that products in consumer-size cotton bags were received in practically all northern markets in the East, in many southern markets, and in some western markets. Wholesalers and retailers reported that products sold in small cotton bags usually are packaged at shipping points, although some potatoes, onions, and citrus fruits have been packaged at destination. Many chain-store operators and independent retailers, as well as producers and shippers, favor the use of small cotton bags for these three products. When sound and well graded, these products carry in small cotton bags satisfactorily under ordinary transportation conditions.

HOME MANAGEMENT AND EQUIPMENT

Community canning centers, M. C. Stienbarger and M. Birdseye (*U.S. Dept. Agr., Bur. Home Econ., 1933, pp.* [*2*]+*15*+[*7*], *figs. 5*).—This contribution from the Bureau of Home Economics and Office of Cooperative Extension Work, U.S.D.A., has been prepared as an aid to those organizing and operating community canning centers for various purposes. Among the material included are types of centers to meet different conditions, arrangements for financing and supervising, planning space for work and equipment, types of equipment, sample canning budgets, important points in the canning process, working diagrams of canning centers, and a partial list of manufacturers of home canning equipment.

Community sewing in relief programs (*U.S. Dept. Agr., Bur. Home Econ.,* [*1933*], *pp. 16, figs. 38*).—Practical suggestions are given for the organization and work of community sewing centers as a part of relief programs, including a list of essential equipment for clothing workrooms; advice on the selection of patterns, choice of fabrics, and types of garments that can be made from old clothing; and a list of inexpensive publications illustrating and explaining sewing processes, together with supplemental suggestions and designs illustrated by sketches and with recommended patterns for clothing of various types for all ages.

Household care and cleaning, G. J. Ward and I. M. Hitchcock (*Illinois Sta. Circ. 416* (*1934*), *pp. 24*).—Part 1 of this circular consists of practical directions for the housewife on the care of cleaning equipment and on supplies and methods for cleaning floors and floor coverings, furniture and woodwork, walls, windows, household equipment, and various metals such as are used in equipment and cutlery. Part 2 consists of recipes for hard water softeners, spot removers, soap and soap solutions, glass and silver polishes, wax polishes and oil solutions for furniture, floors, and woodwork, and solutions for cleaning painted walls.

Household refrigeration: A partial list of references (*U.S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 5, rev.* (*1933*), *pp. 33*).—This revision of an earlier list of references (E.S.R., 59, p. 695) was prepared for the President's Conference on Home Building and Home Ownership, but contains references to a number of articles which have appeared since the completion of that report. "The references are arranged under subject headings, and brief annotations are included where the title is not sufficiently explanatory. A number of the references are concerned mainly with theory. Others cite the results of research, especially investigations initiated in an attempt to develop methods for testing refrigerators. Some articles are listed which discuss in a popular way the facts about household refrigeration that are of special interest to the homemaker. Some references, concerned primarily with commercial installations and with the comparatively new field of summer air conditioning and house cooling, have been included because they contain certain material which has a distinct bearing on the problems of household refrigeration. It is hoped that this list will indicate the general scope of the available material on the subject of household refrigeration and show the very great need for further research in this important field."

MISCELLANEOUS

Aiding Arizona's agriculture: Forty-fourth Annual Report [of Arizona Station], 1933, P. S. Burgess (*Arizona Sta. Rpt. 1933, pp. 93, figs. 16*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue. Meteorological observations are also reported.

Fifty-sixth Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1932, W. L. Slate et al. (*Connecticut [New Haven] Sta. Rpt. 1932, pp. [909], figs. 182*).—In addition to the usual administrative data, this report contains reprints of Bulletins 343–354, previously noted, and of the following circulars: Nos. 87, Testing Vegetables for Connecticut: Results for 1932, by L. C. Curtis (pp. 1–15); 88, Control of the Mexican Bean Beetle, by N. Turner and R. B. Friend (pp. 17–24); 89, Soil Testing Service, by M. F. Morgan (pp. 25–27); 90, The European Pine Shoot Moth, by R. B. Friend and H. W. Hicock (pp. 29–31); 91, Unemployment Gardens (pp. 33–42); 92, Control of the European Corn Borer, by M. P. Zappe (pp. 45–49); and 93, Insects That Injure Cucumber, Melon, Pumpkin, and Squash Plants in Connecticut, by W. E. Britton (pp. 51–57).

Thirteenth Annual Report [of Georgia Coastal Plain Station], 1932, S. H. Starr (*Georgia Coastal Plain Sta. Bul. 21 (1933), pp. 105, figs. 8*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Guam Agricultural Experiment Station, 1930–31, 1931–32, C. W. Edwards et al (*Guam Sta. Rpt. 1931–32, pp. [2]+24, figs. 10*).—In addition to reports of work carried on during the fiscal years ended June 30, 1931, and June 30, 1932, a summary of results from the establishment of the station in 1909 to its closing in 1932 is included. The experimental features not previously referred to are noted elsewhere in this issue.

Forty-sixth Annual Report [of Cornell Station], 1933, C. E. Ladd et al. (*[New York] Cornell Sta. Rpt. 1933, pp. 169*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-second Annual Report of the New York State Agricultural Experiment Station [1933], U. P. Hedrick (*New York State Sta. Rpt. 1933, pp. 113*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-fifth Annual Report of the North Carolina Agricultural Experiment Station [1932], R. Y. Winters et al. (*North Carolina Sta. Rpt. 1932, pp. 84*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual report of the director [of the South Dakota Station] for the fiscal year ending June 30, 1933, J. W. Wilson et al. (*South Dakota Sta. Rpt. 1933, pp. 38*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-third Annual Report of [Wyoming Station, 1933], J. A. Hill (*Wyoming Sta. Rpt. 1933, pp. 39*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue. Meteorological observations are also included.

NOTES

Georgia College.—Dr. Andrew MacNairn Soule, president from 1907 to 1933 and widely known for his active leadership in the development of agricultural education in the South, died at Atlanta on April 16. Dr. Soule was born at Hamilton, Ont., on July 8, 1872, and graduated from the University of Toronto in 1893. Coming to this country in the following year as assistant to the director of the Missouri Station, he subsequently served at the Texas College and Station as assistant professor of agriculture and assistant agriculturist from 1894 to 1899; at the Tennessee University and Station as vice director and agriculturist from 1899 to 1903, director from 1903 to 1904, and chairman of the agricultural faculty from 1899 to 1904; and in Virginia as dean of the College of Agriculture and director of the station from 1904 to 1907. He was also a leader in farmers' institute work in Tennessee, Virginia, and Georgia, and president of the American Association of Farmers Institute Workers in 1913. He was Federal food administrator in Georgia from 1917 to 1919, and had recently been appointed director of the National Emergency Council and State compliance director of the N.R.A. His most notable achievement was probably the upbuilding of the Georgia State College of Agriculture, recognition of his success being manifested in the conferring upon him by the University of Georgia of the Sc.D. degree in 1910 and the LL.D. degree in 1916.

Dr. Soule was for many years active in the Asociation of Land-Grant Colleges and Universities and elected president in 1929. His address before that body in 1930 was entitled Contributions of the Land-Grant Colleges and Universities to Our Social and Economic Progress. This address was "a brief recital of some of the major accomplishments" of these institutions, from which he credited to them "an amazing record of achievements in the fields which they were originally designed to cover and serve. These institutions have unquestionably established themselves firmly in the affections of the people of the United States. They have also discovered and now occupy a well-differentiated but peculiarly appropriate and essential position with regard to our social and economic progress. They have fulfilled in a superb and unique manner the hopes and aspirations of the founders. They have demonstrated the wisdom and clarity of vision of our forefathers. They have contributed most effectively and generously to the welfare of every interest of our great country. They richly deserve the further endorsement and more generous support of both the State and Federal Governments, with which their work is so closely associated and so happily integrated."

Iowa Station.—What is known as an experimental erosion nursery is being established at the station in cooperation with the U.S.D.A. Bureau of Plant Industry. The purpose of this nursery will be to develop or select by experimental planting suitable plants, including trees, shrubs, grasses, or other types which may be used in controlling soil erosion. Plant materials selected from throughout Iowa, other parts of the United States, and foreign countries will be tested. It is the intention to propagate only in sufficient quantities to permit of thorough testing at other points in the area to be served, which includes Iowa and parts of adjoining States. The plan contemplates a director for the nursery, an assistant director, a forest experimentalist, an ecologist, one or more plant propagators, and other necessary supporting personnel.

Kansas College.—Dr. William M. Jardine, president from 1918 to 1925 and subsequently Secretary of Agriculture and U.S. Minister to Egypt, has been appointed president of the Municipal University of Wichita, beginning March 1.

Montana College and Station.—The resignations are announced of Dr. W. M. Martin as associate chemist in the station and C. C. Starring as associate professor of horticulture and associate horticulturist to enter commercial work, and of H. E. Tower as assistant in agronomy at the Judith Basin Substation to take up work with the U.S. Soil Erosion Service. O. W. Monson, assistant professor of agricultural engineering and assistant agricultural engineer, has been appointed head of a new department of irrigation engineering. J. H. Pepper has been appointed assistant entomologist.

Rutgers University.—Kenneth S. Morrow, associate extension dairyman, has been appointed professor of dairy husbandry in the University of New Hampshire.

North Dakota College and Station.—The retirement on July 1 is announced of Dr. P. F. Trowbridge, director of the station since 1918 and previously connected with chemical work of the Universities of Michigan, Illinois, and Missouri since 1894. Dr. H. L. Walster, dean of the School of Agriculture, will also become director of the station.

Dr. Charles E. Kellogg, assistant professor of agronomy (soils) has been appointed professor and given leave of absence to assist the U.S.D.A. Bureau of Chemistry and Soils in the soil survey.

Oregon College.—*School and Society* notes that Dr. William J. Kerr, chancellor of the State system of education since 1932 and president of the college for the preceding 25 years, has tendered his resignation, effective as soon as a successor is chosen.

Pennsylvania College and Station.—R. Adams Dutcher, head of the department of agricultural and biological chemistry, sailed for Germany on March 1, and for the next 6 months he expects to devote the major portion of his time to visiting the universities and experiment stations of that country and in making a detailed survey of the vitamin research laboratories in 10 other northern and central European countries. During his trip abroad he is serving as a collaborator for the U.S.D.A. Bureau of Chemistry and Soils and as a fellow of the Oberlaender Trust of the Carl Schurz Memorial Foundation.

Virginia Station.—Aja Che Seymour, assistant rural sociologist in the station since 1931, died March 27 at the age of 35 years. He was a native of Tennessee, receiving the B.S.A. degree from the University of Tennessee in 1929 and the M.S.A. degree in 1930. He had served as research assistant in agricultural economics in the University of Tennessee from 1929 to 1930 and as research assistant in rural sociology in Cornell University in 1930–31.

Dr. John M. Ellison, field assistant in rural sociology, resigned March 15. A. L. Grizzard became assistant agronomist on March 1 and will have charge of fertilizer experiments in cooperation with the Tennessee Valley Authority.

West Virginia University and Station.—Dr. M. M. Hoover, associate professor of agriculture and associate agronomist, has resigned to become director of the State Soil Erosion Service, with headquarters at Spencer. C. R. Burnham has been appointed assistant professor of genetics and assistant geneticist, and L. S. Bennett, instructor of agronomy and genetics in the college and assistant in the station.

New Weather Forecast Program.—With the cooperation of the War, Navy, and Commerce Departments, the Weather Bureau of the U.S. Department of Agriculture is launching, July 1, part of a new program for increasing the accuracy of its forecasts. This new program, among other things, calls for more stations for upper air soundings by airplanes. Facilities offered by Army and Navy pilots at more than a dozen selected stations, at six specially equipped Weather Bureau airway stations, and at a cooperative station at the Massachusetts Institute of Technology will be now available for the purpose. The Department of Commerce will provide for the transmission of the observations from the points where they are taken to the forecasting stations.

According to the present plan, observation flights will be confined to one a day, each beginning about 5:30 a.m. (E.S.T.) and reaching a maximum height of 17,000 ft. above sea level. These flights will be made by Army and Navy pilots and by commercial aviators hired for the purpose by the Weather Bureau. Meteorologists of the Weather Bureau assigned to the air-observation stations will compute, code, and transmit to forecast stations the information the meteorographs bring down. This information will give forecasters an important supplement to the morning surface observations in drawing the weather maps to be used in making the daily forecasts.

The Weather Bureau expects to maintain special airplane observation stations at the following airports: Nashville, Tenn., with La Crosse, Wis., as an alternate; Omaha, Nebr.; Cheyenne, Wyo.; Billings, Mont.; Fargo, N.Dak.; and Oklahoma City, Okla. The War Department will assign planes for this work at Mitchel Field, Long Island, N.Y.; Selfridge Field, Detroit, Mich; Wright Field, Dayton, Ohio; Scott Field, East St. Louis, Ill.; Kelly Field, San Antonio, Tex.; Maxwell Field, Montgomery, Ala.; and, during the hurricane season, at Fort Crockett, Galveston, Tex. The National Guard unit at Spokane, Wash., has assumed the responsibility for collecting the needed information there.

The Navy Department will make observations at the following stations: Anacostia, D.C.; Norfolk, Va.; Pensacola, Fla.; San Diego, Calif.; Pearl Harbor, Hawaii; and, on alternate days, at Philadelphia, Pa., and Lakehurst, N.J. Observation flights at Sunnyvale, Calif., and Seattle, Wash., because of darkness at the hour set for the flights, will be made at some daylight hour. Occasional flights may be made also from Quantico, Va., Dahlgren, Va., and Coco Solo, Canal Zone. Certain battleships, when in port, and sometimes at sea, send up planes to observe weather conditions. Although they are not expected to order routine flights, the following ships will contribute information useful to Weather Bureau forecasters at San Francisco, Calif., or at Washington, D.C., depending on the fleet's location: Saratoga, Lexington, Langley, Ranger, Wright, California, and Chicago.

Miscellaneous.—The first award of the gold medal of the Royal Agricultural Society of England in recognition of distinguished service to agriculture has been made to Sir Thomas Middleton, vice chairman of the Development Commission, and the first president of Section M, Agriculture, of the British Association at the time of its organization in 1912.

Dr. Frank T. Shutt, Dominion chemist and assistant director of Experimental Farms of the Canadian Department of Agriculture, has retired after a service of 45 yr.

W. H. Sproule has been appointed head of the dairy department of the Ontario Agricultural College.

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